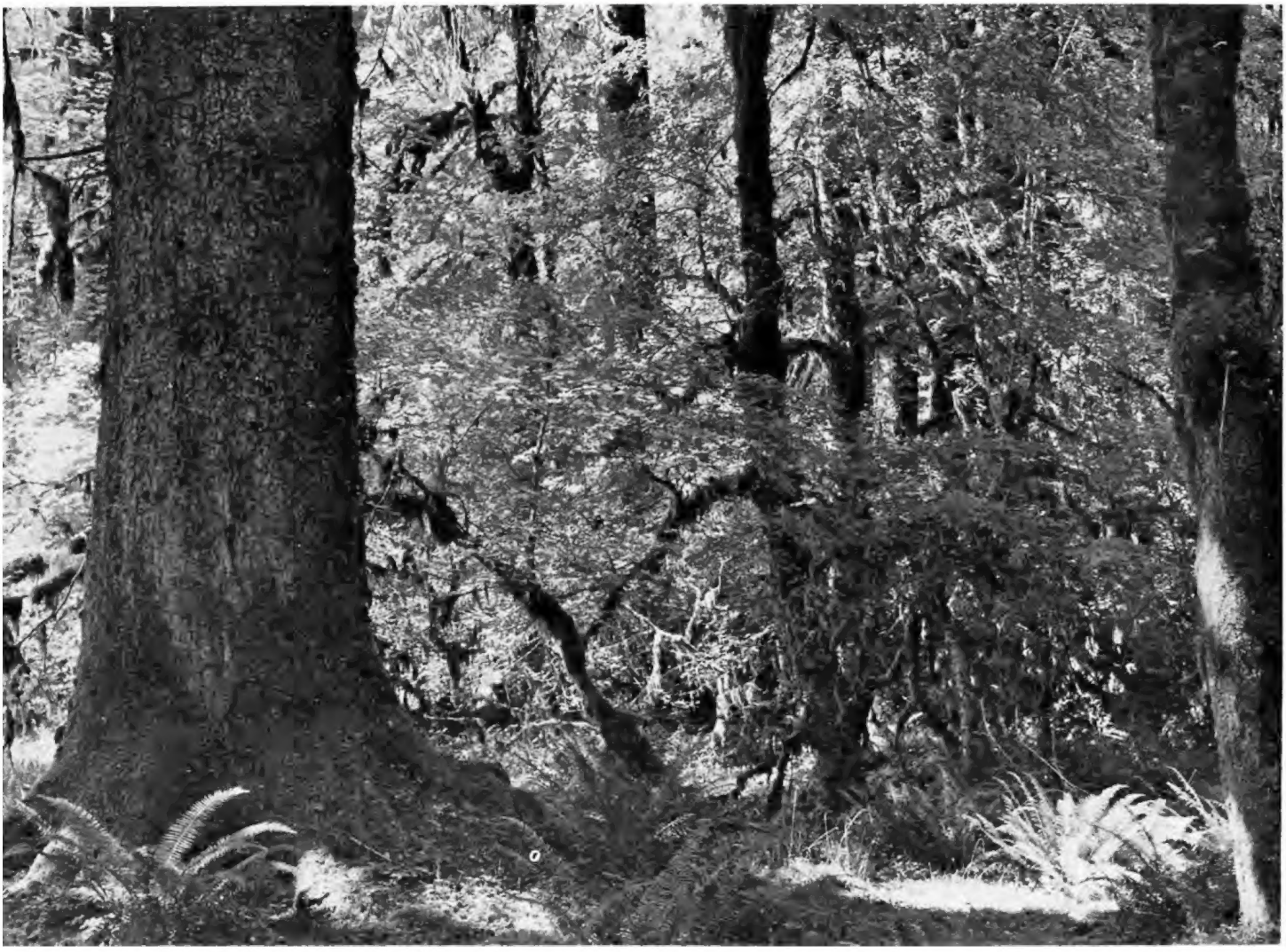
SOIL SURVEY OF

Jefferson County Area, Washington



United States Department of Agriculture
Soil Conservation Service
In cooperation with
Washington Agricultural Experiment Station

Major fieldwork for this soil survey was completed in 1968. Soil names and descriptions were approved in 1969. Unless otherwise indicated, statements in the publication refer to conditions in the Area prior to 1968. This survey was made cooperatively by the Soil Conservation Service and the Washington Agricultural Experiment Station. It is part of the technical assistance furnished to the Jefferson County Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of the Jefferson County Area are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise it is outside, and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the woodland group in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions in the section "Use and Management of the Soils."

Foresters and others can refer to the section "Use of the Soils for Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain estimates of soil properties and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in the Jefferson County Area may be interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given at the beginning of the publication.

Cover: Giant Sitka spruce and vine maple near Queets River in the western part of Jefferson County Area. The soil is Queets silt loam.

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SOIL SURVEY OF JEFFERSON COUNTY AREA, WASHINGTON

BY FRED R. McCREARY, SOIL CONSERVATION SERVICE

SURVEYED BY FRED R. McCREARY AND MILES L. RAVER, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE WASHINGTON AGRICULTURAL EXPERIMENT STATION

JEFFERSON COUNTY AREA is on the Olympic Peninsula of Northwestern Washington (fig. 1). Total area of Jefferson County is 1,155,330 acres, of which 479,925 acres, in the eastern and western parts, are included in this survey. The two parts are separated by the Olympic National Park and the Olympic National Forest. Port Townsend, the largest city in Jefferson County and the county seat, is 40 miles northwest of Seattle, 75 miles north of Olympia, and 255 miles west of Spokane.

Annual precipitation ranges from 18 to 70 inches in the eastern part of the survey area and from 100 to 180 inches in the western part

The original vegetation of the area was mainly coniferous forest, except for a small area near Port Townsend where it was dominantly bunchgrasses Elevation in the survey area ranges from sea level to 3,400 feet.

The eastern part of Jefferson County consists of relatively low, rolling to moderately steep, glacial terraces and long, narrow valleys in the northern and northeastern sections. The southern section of this part consists principally of moderately steep to steep glacial terraces and very steep, rough, broken mountain foothills

In the western part of Jefferson County is a coastal area 30 miles long that includes many beaches and rocky cliffs The broad valleys of several large rivers traverse the area

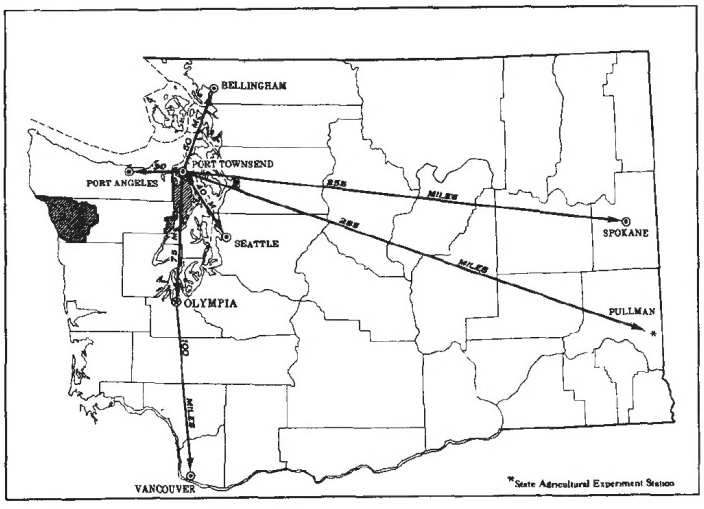

Figure 1.—**Location of Jefferson County Area in Washington.**

The coastal area consists principally of gently rolling to moderately steep, glacially terraced uplands interspersed with numerous swampy depressions and several mountain spur ridges 1,000 to 1,500 feet tall The topography eastward to the Olympic National Park boundary rises abruptly to 3,400 feet to become part of the steep to very steep western flanks of the Olympic Mountains.

Forest products are the major economic resource of Jefferson County, and more than half the county's workers are engaged in harvesting and processing these products. About 21,000 acres are used for growing crops other than trees. Approximately 2,000 acres are irrigated Most of the farmed acreage is planted to pasture for livestock. Other crops are winter wheat, oats, vegetables, cane fruits, and strawberries.

Soils in the western section of the survey area are notably different from those in the eastern section. Although about 4,000 acres of fairly good alluvial river bottom soils are in the western part, most of the soils of this area are not well suited to farming They are suitable mainly for growing "high rainfall" forest products. They are strongly or very strongly acid, gravelly or rocky, saturated most of the year, and in many places steep to very steep. In the eastern part of the county, most soils are too gravelly and stony or too steep for farming. Approximately 40,000 acres of nearly level to moderately steep soils in this part, however, are suitable for farming. About half of these soils are relatively poor, and nearly all of them are deficient in the essential elements of nitrogen, potassium, and phosphate. Most soils of this eastern section are most suitable for growing trees or other forest products.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in the Jefferson County Area, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in

counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series generally is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Hoh and Calawah, for example, are the names of two soil series All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Kitsap silt loam, 0 to 15 percent slopes, is one of several phases within the Kitsap series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of this publication was prepared from aerial photographs

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Three such kinds of mapping units are shown on the soil map of the Jefferson County Area: soil complexes, soil associations, and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen Hoodsport-Grove very gravelly sandy loams, 0 to 30 percent slopes, is an example.

A soil association is made up of adjacent soils that occur as areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified A considerable degree of uniformity in pattern and relative extent of the dominant soils exists, but the soils may differ greatly one from another. The name of an association consists of the names of the dominant soils, joined by a hyphen. Calawah-Tealwhit association, gently rolling, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." McMurray and Mukilteo peats is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Rough broken land is a land type in the Jefferson County Area.

The survey of the western part of the Area is of low intensity, and the survey of the eastern part of the Area is of medium intensity. The composition of the low-intensity mapping units is more variable than that of the medium-intensity mapping units, but interpretations of the suitability of the soils for various uses are valid for mapping units of both intensities.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and when the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland and range, and engineers

On the basis of yield and practice tables and other data, the soil scientists set up trial groups They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in the Jefferson County Area. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in an area, who want to compare different parts of an area, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in this survey have been grouped into two general groups for broad interpretative purposes. Each of the broad groups and the soil associations in each group are described in the following pages.

Slightly Acid to Strongly Acid Soils

The seven soil associations in this group make up the eastern part of the Jefferson County Area. Elevation ranges from sea level to 2,000 feet. Annual precipitation is 18 to 65 inches.

1. Triton-Hoodsport association

Moderately well drained, nearly level to very steep, very gravelly soils underlain by compact glacial till or basalt

This association is on uplands along Hood Canal in the southeastern part of the Jefferson County Area. Douglas-fir, western hemlock, western redcedar, red alder, madrone, ornamental shrubs, and mixed grasses cover most of the landscape Elevation ranges from sea level to 1,800 feet. Annual precipitation is 50 to 65 inches.

This association covers about 19,500 acres. Triton soils make up about 32 percent of the association; Hoodsport soils, about 19 percent, Ahl soils, about 15 percent; Grove soils, about 13 percent; Olete soils, about 6 percent; and Belfast and Lystair soils, about 15 percent.

Ahl and Triton soils are steep to very steep soils of the foothills. Hoodsport, Grove, and Lystair soils are nearly level to sloping and are on glacial terraces. Belfast soils are nearly level and are on river bottom lands

The Triton, Hoodsport, and Ahl soils are very gravelly throughout They are underlain at a depth of 12 to 40 inches by either a cemented layer that formed in very compact glacial till or by basalt bedrock.

Most of the association is used for growing timber, ornamental shrubs, and commercial brush.

2. Quilcene-Alderwood-Cathcart association

Moderately well drained and well drained, nearly level to very steep soils underlain by shale, sandstone, or compact glacial till

This association is along both sides of U S. Highway 101 just north of Quilcene and east of Crocker Lake. It is in the eastern part of the survey area. The soils formed in weathered shale, sandstone, and glacial till. Douglas-fir, western redcedar, western hemlock, vine maple, bigleaf maple, red alder, elderberry, red huckleberry, salmonberry, and swordfern cover most of the landscape Elevation ranges from 200 to 500 feet. Annual precipitation is 30 to 45 inches

This association covers about 6,200 acres. Quilcene soils make up about 47 percent of the association; Alderwood soils, about 36 percent; Cathcart soils, about 12 percent; and Belfast, Swantown, and Wapato soils and organic soils, about 5 percent

Quilcene soils have a surface layer of silt loam and a subsoil of silty clay loam and gravelly clay They are underlain at a depth of 20 to 40 inches by weathered shale.

Alderwood soils have a surface layer of gravelly sandy loam or gravelly loam and a subsoil of gravelly sandy loam They are underlain at a depth of 20 to 60 inches by a cemented layer that formed in very compact glacial till.

Cathcart soils have a surface layer of gravelly silt loam and a subsoil of gravelly loam. They are underlain at a depth of 24 to 40 inches by sandstone bedrock

Most of the association is used for growing forest products. It is also used as wildlife habitat and for recreation. A few acres have been cleared and are used for permanent pasture or for diversified home garden crops.

3. Clallam-Hoypus-Dick association

Well drained and somewhat excessively drained, nearly level to very steep soils underlain by compact glacial till, loamy sand and gravel, or gravelly sand

This association is in the northern part of the survey area, mostly on Quimper Peninsula. Douglas-fir, western hemlock, white pine, western redcedar, madrone, dogwood, salal, Oregon grape, wild blackberry, evergreen huckleberry, rhododendron, and bracken cover most of the landscape. Elevation ranges from 50 to 500 feet. Annual precipitation is 18 to 30 inches.

This association covers about 34,750 acres. Clallam soils make up about 32 percent of the association; Hoypus soils, 31 percent, Dick soils, 20 percent; Cassolary soils, 5 percent; San Juan soils, 4 percent, and Agnew, Belfast, Tisch, Townsend, and organic soils, 8 percent.

Clallam soils are gravelly sandy loam throughout. They have a cemented layer that formed in very compact glacial till at a depth of 20 to 40 inches

Hoypus soils are gravelly loamy sand or sandy loams. They are underlain by very gravelly sand at a depth of about 44 inches.

Dick soils are loamy sand to a depth of 60 inches or more.

Most of the association is used for growing forest products, as wildlife habitat, for recreation, and for rural home development. A few acres have been cleared and are used for permanent pasture or for diversified home garden crops.

4. Semiahmoo-McMurray-Mukilteo association

Very poorly drained, nearly level organic soils

This association is located mostly in the glacial depressions and stream valley areas throughout the east and west arms of Chimacum Valley. It is in the eastern part of the survey area. The soils formed in plant remains in various stages of decomposition. Sedges, reeds, and water-tolerant willows, shrubs, moss, and grasses cover most of the landscape. Elevation ranges from about 100 to 250 feet. Annual precipitation is 20 to 30 inches.

This association covers about 4,600 acres. Semiahmoo muck makes up about 48 percent of the association; McMurray peat, 21 percent; Mukilteo peat, 21 percent; and Belfast, Casey, Snohomish, Swantown, and Tisch soils, about 10 percent.

Semiahmoo muck is mostly highly decomposed and disintegrated material, particularly in the upper 12 to 18 inches. McMurray and Mukilteo peats consist mainly of fibrous or woody plant tissues.

Most of the soils of this association have been drained and are intensively farmed. They are very well suited to hay and pasture, for which most of them are used. They are also used for a variety of berries, small grains, vegetables, and specialty crops. Successful farming of these soils requires intensive, well controlled drainage and periodic applications of fertilizers.

5. Alderwood-Sinclair association

Moderately well drained, dominantly strongly sloping to steep, gravelly soils underlain by compact glacial till

This association is in the eastern part of the survey area. The soils formed in glacial till. Douglas-fir, western hemlock,

western redcedar, red alder, vine maple, bigleaf maple, salal, Oregon grape, evergreen and red huckleberry, rhododendron, swordfern, and bracken cover most of the landscape. Elevation ranges from near sea level to about 2,000 feet. Annual precipitation is 18 to 45 inches.

This association covers about 69,000 acres. Alderwood soils make up about 40 percent of the association, Sinclair soils, 25 percent; Cassolary soils, 11 percent; Dabob soils, 10 percent, Beausite soils, 9 percent, and Belfast, Cathcart, Everett, Hoypus, Indianola, Swantown, and organic soils, about 5 percent.

Alderwood and Sinclair soils are gravelly throughout. They have a cemented layer that formed in very compact glacial till at a depth of 20 to 40 inches.

Most of the association is used for growing forest products. About 10 percent of the acreage has been cleared and is used for pasture, hay, small grains, fruit trees, or home garden crops.

6. *Olete-Hoodsport association*

Well drained and moderately well drained, dominantly strongly sloping to steep, very gravelly soils underlain by basalt or compact glacial till

This association is located mainly in the Quilcene area, west and north along the borders of the Olympic National Forest in the eastern part of Jefferson County. The soils formed in material weathered from basalt, glacial till, and outwash. Douglas-fir, western hemlock, western redcedar, vine maple, bigleaf maple, red alder, dogwood, red and evergreen huckleberry, salal, Oregon grape, rhododendron, swordfern, and bracken cover most of the landscape. Elevation ranges from about 200 to 1,000 feet. Annual precipitation is 30 to 55 inches.

This association covers about 11,000 acres. Olete soils make up about 52 percent of the association; Hoodsport soils, 32 percent; Grove soils, 9 percent; and Alderwood, Beausite, Belfast, Lystair, Quilcene, and Wapato soils, about 7 percent.

Olete and Hoodsport soils, the principal soils in this association, are very gravelly throughout. They are underlain by basalt bedrock or a cemented layer at a depth of 20 to 40 inches

Most of the association is used for providing timber and minor forest products. It is also used as wildlife habitat and for recreation.

7. *Whidbey-Dick association*

Well drained and somewhat excessively drained, undulating to hilly, gravelly and sandy soils underlain by compact glacial till or loamy sand

This association is on the twin islands of Indian and Marrowstone. Indian Island forms the eastern side of Port Townsend Bay, and Marrowstone Island borders Admiralty Inlet, 3 miles west of Whidbey Island. Douglas-fir, western redcedar, western hemlock, madrone, dogwood, rhododendron, salal, Oregon grape, wild blackberry, evergreen huckleberry, bracken, and ocean spray cover most of the landscape Elevation ranges from near sea level to about 300 feet. Annual precipitation is 18 to 26 inches.

This association covers 6,717 acres. Whidbey soils make up 55 percent of the association; Dick soils, 12 percent; Cathcart soils, 9 percent; Hoypus soils, 5 percent; and Casey, Alderwood, Belfast, Agnew, and Indianola soils, 19 percent.

Whidbey soils are gravelly sandy loam and have a cemented layer that formed in very compact glacial till at a depth of 20 to 40 inches. Dick soils are loamy sand to a depth of 60 inches or more.

Indian Island is federally owned and is used by the Navy as an ammunition depot. The soils here are used mainly for the growth and preservation of the native forest trees and brush. On Marrowstone, forest products are important, but they are becoming less important annually because of a rapid influx of people who are buying small acreages. Many of these people clear a small part of their land and leave most of it in native trees. Fort Flagler, covering about 1,000 acres at the north end of Marrowstone Island, is mostly wooded. Today about one-fourth of this island is cleared, and most of the cleared acreage is used for pasture and hay. The rest of the island is used mostly for homesites and small home gardens.

Strongly Acid and Very Strongly Acid Soils

The three soil associations in this group make up the western part of the Jefferson County Area. Elevation ranges from sea level to 3,500 feet. Annual precipitation is 100 to 180 inches.

8. *Dimal-Solleks-Snahopish association*

Somewhat excessively drained and well drained, moderately steep to very steep, dominantly flaggy and channery soils underlain by weathered sandstone and shale

This association is in the Olympic Mountain foothills, in the western part of the survey area. The soils formed in highly weathered greywacke, sandstone, and shale bedrock. Vegetation is variable, depending on slope and elevation. At elevations of about 2,000 to 3,500 feet, 60 to 80 percent of the forest trees are Pacific silver fir; 15 to 30 percent are western hemlock, western redcedar, and mountain hemlock; and the rest are Douglas-fir. From about 300 to 2,000 feet, 60 to 75 percent are western hemlock; about 20 percent are western redcedar, Sitka spruce, and white fir; about 3 percent are Douglas-fir; and the rest are mainly redalder, vine maple, and bigleaf maple. Most of the understory at higher elevations consists of young trees and annual and perennial small plants and grasses. The understory at lower elevations consists mainly of red and blue huckleberry, salal, salmonberry, swordfern, and deerfern. Annual precipitation is 120 to 180 inches.

This association covers about 165,000 acres. Dimal soils make up about 54 percent of the association; Solleks soils, 15 percent; Snahopish soils, 12 percent; and Calawah, Hoko, Itswoot, and Klone soils, about 19 percent.

Dimal soils are very flaggy silty clay loam throughout. They are underlain at a depth of 10 to 20 inches by sandstone and shale bedrock.

Solleks soils have a surface layer of channery and very channery silty clay loam and a subsoil of very channery silty clay loam. They are underlain at a depth of 30 to 48 inches by shale bedrock.

Snahopish soils have a surface layer of silty clay loam, a subsoil of silty clay loam and gravelly silty clay loam, and a substratum of very gravelly silty clay loam.

Most areas of the association are used for growing native forest trees, mainly virgin conifers. Less than 10 percent

consists of the dominant hardwoods—alder, cottonwood, and maple. The fast-growing alder and cottonwood have an increasing commercial potential

9. Hoko-Klone-Calawah association

Moderately well drained and well drained, undulating to hilly, mostly gravelly soils, some of which are underlain by compact glacial till or marine sediments

This association is in the western part of the survey area, where the landscape is undulating to hilly and traversed by numerous small, medium, and large streams. Forest trees are mainly western hemlock, western redcedar, white fir, Sitka spruce, and scattered red alder, maple, and cottonwood trees. The understory is mostly salal, salmonberry, red and blue huckleberry, red elderberry, devilsclub, deerfern, and swordfern. Annual precipitation is 100 to 165 inches.

This association covers about 111,000 acres Hoko soils make up about 33 percent of the association; Klone soils, 32 percent; Calawah soils, 24 percent; Tealwhit soils, 6 percent; and Itswoot, Kalaloch, Phelan, Sekiu, and Snahopish soils, about 5 percent.

Hoko soils are gravelly throughout. They have a cemented layer that formed in very compact glacial till at a depth of 20 to 40 inches

Klone soils have a surface layer and subsoil of gravelly silt loam and a substratum of very gravelly sandy loam and very gravelly loamy sand.

Calawah soils have a surface layer of heavy silt loam, a subsoil of heavy silt loam and light silty clay loam, and a substratum of light silty clay loam and silty clay.

Most of the association is used for growing native forest trees. Extensive areas of clear-cut logged land are being restocked heavily with Douglas-fir. Less than 10 percent of the trees are hardwoods.

10. Queets-Kalaloch-Huel association

Moderately well drained and well drained, mostly nearly level, loamy and sandy soils of flood plains

This association is mostly in the valleys of the Hoh, Queets, and Bogachiel Rivers in the western part of the survey area. The soils formed in alluvium. The principal trees, in order of dominance, are Sitka spruce, red alder, western hemlock, western redcedar, cottonwood, vine maple, and bigleaf maple. The understory is mostly salmonberry, swordfern, deerfern, red and blue huckleberry, devilsclub, red elderberry, wild evergreen and Himalaya blackberry, salal, and perennial grasses and sedges. Elevation ranges from slightly above sea level to about 300 feet. Annual precipitation is 120 to 160 inches.

This association covers about 19,500 acres. Queets soils make up about 29 percent of the association; Kalaloch soils, about 25 percent; Huel soils, about 23 percent, Hoh soils, 17 percent; and Klone, Hoko, Tealwhit, and Sekiu soils, about 6 percent.

Queets soils have a surface layer and subsoil of silt loam and a substratum of fine sandy loam.

Kalaloch soils have a surface layer and subsoil of loam and a substratum of stratified fine sandy loam, loamy fine sand, and fine sand.

Huel soils have a surface layer of loamy fine sand Beneath this is stratified fine sandy loam, very gravelly sand, and very gravelly loamy sand.

The association is used mostly for growing forest products, but it includes the soils that have the best potential for farming of any in the western part of the survey area. Approximately 15 percent of the acreage of this association, mostly Hoh and Queets soils, has been cleared and is used for permanent pasture or for diversified home garden crops. Nearly all of the people of this "rain forest" area live on small ranches. Several thousand acres of uncleared bottom land are used for grazing livestock, mostly beef.

Descriptions of the Soils

The soil series and mapping units in the Jefferson County Area are described in this section. Each soil series is described in detail, and then, briefly, each mapping unit in that series is described. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile The first is brief and in terms familiar to the layman. The second, detailed and in technical terms, is for scientists, engineers, and others who need to make thorough and precise studies of soils. Unless it is otherwise stated, the colors given in the descriptions are those of a moist soil.

As mentioned in the section "How This Survey Was Made," not all mapping units are part of a soil series. Rock land, for example, does not belong to a soil series, but nevertheless, is listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. If the symbol is a combination of lower- and uppercase letters, the soil is mapped as part of the medium-intensity survey. An example is BaB If the symbol is uppercase letters only, the soil is mapped as part of the low-intensity survey. An example is CGB Soils having two symbols are mapped as part of the surveys of both intensities. An example is Co and CW for Coastal beaches. Listed at the end of each description of a mapping unit is the capability unit and woodland group in which the mapping unit has been placed. The page for the description of each capability unit and woodland group to which each soil has been assigned can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*9*).[1]

Agnew Series

The Agnew series consists of somewhat poorly drained soils that formed in glacial lake or marine deposits. They

[1] Italic numbers in parentheses refer to Literature Cited, p. 98.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Agnew silt loam, 0 to 8 percent slopes	1,180	0.25
Agnew silt loam, 30 to 50 percent slopes	230	05
Ahl very gravelly loam, 50 to 70 percent slopes	1,900	.40
Ahl-Rock outcrop complex, 50 to 90 percent slopes	1,190	.25
Alderwood gravelly sandy loam, 0 to 15 percent slopes	16,110	3.36
Alderwood gravelly sandy loam, 15 to 30 percent slopes	6,980	1 45
Alderwood gravelly sandy loam, 30 to 50 percent slopes	260	.05
Alderwood gravelly loam, 0 to 15 percent slopes	5,800	1.21
Alderwood gravelly loam, 15 to 30 percent slopes	3,800	.79
Alderwood-Quilcene complex, 0 to 15 percent slopes	540	.11
Beausite gravelly sandy loam, 15 to 30 percent slopes	1,370	.29
Beausite gravelly sandy loam, 30 to 50 percent slopes	930	.19
Beausite-Alderwood complex, 0 to 30 percent slopes	2,040	.43
Beausite-Alderwood complex, 30 to 50 percent slopes	720	15
Beausite-Rock outcrop complex, 0 to 50 percent slopes	1,870	.39
Belfast fine sandy loam	390	.08
Belfast silt loam	860	18
Belfast silt loam, heavy variant	860	18
Belfast silt loam, wet variant	610	.13
Belfast silty clay loam, wet variant	860	.18
Calawah silt loam, 0 to 8 percent slopes	19,620	4 09
Calawah-Snahopish association, moderately steep	6,690	1 39
Calawah-Tealwhit association, gently rolling	2,330	.49
Carlsborg gravelly loamy sand, 0 to 15 percent slopes	660	.14
Carlsborg gravelly loamy sand, 15 to 30 percent slopes	1,240	26
Casey fine sandy loam, 0 to 8 percent slopes	210	04
Casey silt loam, 0 to 8 percent slopes	500	.10
Cassolary sandy loam, 0 to 15 percent slopes	3,130	.65
Cassolary sandy loam, 15 to 30 percent slopes	2,100	.44
Cassolary sandy loam, 30 to 50 percent slopes	1,260	26
Cassolary-Everett complex, 0 to 15 percent slopes	760	.16
Cassolary-Everett complex, 15 to 30 percent slopes	340	07
Cassolary-Kitsap complex, 0 to 15 percent slopes	390	.08
Cassolary-Kitsap complex, 15 to 30 percent slopes	880	18
Cassolary-Kitsap complex, 30 to 50 percent slopes	1,680	.35
Cathcart gravelly silt loam, 0 to 15 percent slopes	6,170	1 29
Cathcart gravelly silt loam, 15 to 30 percent slopes	1,920	.40
Cathcart gravelly silt loam, 30 to 50 percent slopes	1,700	.35
Clallam gravelly sandy loam, 0 to 15 percent slopes	8,170	1 70
Clallam gravelly sandy loam, 15 to 30 percent slopes	1,790	.37
Coastal beaches	2,450	51
Cut and fill land	920	19
Dabob very gravelly sandy loam, 0 to 15 percent slopes	4,910	1 02
Dabob very gravelly sandy loam, 15 to 30 percent slopes	2,170	45
Dick loamy sand, 0 to 15 percent slopes	2,160	.45
Dimal very flaggy silty clay loam, 50 to 90 percent slopes	79,200	16 50
Everett gravelly sandy loam, 0 to 15 percent slopes	1,760	0.37
Everett gravelly sandy loam, 15 to 30 percent slopes	1,080	23
Everett gravelly sandy loam, 30 to 50 percent slopes	660	.14
Grove very gravelly loamy sand, 0 to 15 percent slopes	890	.19
Grove very gravelly loamy sand, 15 to 30 percent slopes	320	07
Grove very gravelly loamy sand, 30 to 50 percent slopes	350	.07
Grove very gravelly sandy loam, 0 to 15 percent slopes	430	09
Grove very gravelly sandy loam, 15 to 30 percent slopes	570	.12
Hoh fine sandy loam	1,380	29
Hoh silt loam	1,920	.40
Hoko gravelly silt loam, 0 to 15 percent slopes	26,940	5 61
Hoko gravelly silt loam, 15 to 30 percent slopes	2,740	57
Hoko gravelly silt loam, 30 to 50 percent slopes	2,390	50
Hoko-Snahopish association, hilly	17,470	3.64
Hoko-Tealwhit association, gently rolling	5,190	1 08
Hoko gravelly silt loam, wet variant, 0 to 8 percent slopes	620	.13
Hoodsport very gravelly sandy loam, 0 to 15 percent slopes	2,100	.44
Hoodsport very gravelly sandy loam, 15 to 30 percent slopes	1,970	.41
Hoodsport gravelly loam, 0 to 15 percent slopes	540	.11
Hoodsport-Grove very gravelly sandy loams, 0 to 30 percent slopes	1,320	.28
Hoypus gravelly loamy sand, 0 to 15 percent slopes	4,670	.97
Hoypus gravelly loamy sand, 15 to 30 percent slopes	2,820	59
Hoypus gravelly loamy sand, 30 to 50 percent slopes	370	.08
Hoypus gravelly sandy loam, 0 to 15 percent slopes	2,600	.54
Huel loamy fine sand	4,540	95
Indianola loamy sand, 0 to 15 percent slopes	590	.12
Indianola loamy sand, 15 to 30 percent slopes	480	10
Indianola sandy loam, 0 to 15 percent slopes	280	.06
Indianola sandy loam, 15 to 50 percent slopes	480	.10
Itswoot very cobbly silt loam, 0 to 30 percent slopes	2,350	.49
Itswoot very cobbly silt loam, 30 to 60 percent slopes	5,840	1.22
Kalaloch loam, 0 to 8 percent slopes	4,270	.89
Kalaloch gravelly loam, 0 to 15 percent slopes	540	11
Kitsap gravelly loam, 0 to 15 percent slopes	460	.10
Kitsap gravelly loam, 15 to 30 percent slopes	300	.06
Kitsap silt loam, 0 to 15 percent slopes	540	.11
Kitsap silt loam, 15 to 30 percent slopes	780	16
Kitsap silt loam, 30 to 50 percent slopes	900	.19
Klone gravelly silt loam, 0 to 30 percent slopes	11,150	2.32
Klone gravelly silt loam, 30 to 60 percent slopes	1,350	.28
Klone cobbly loam, 0 to 30 percent slopes	2,400	50
Klone cobbly loam, 30 to 60 percent slopes	1,140	.24
Klone-Hoko association, moderately steep	21,400	4.46
Klone-Tealwhit association, sloping	1,170	.24
Lummi silt loam	340	.07
Lystair fine sandy loam, 0 to 15 percent slopes	310	.06
McMurray and Mukilteo peats	1,270	.26
Mukilteo peat, moderately shallow variant	750	.16
Olete very gravelly silt loam, 0 to 30 percent slopes	2,670	56
Olete very gravelly silt loam, 30 to 50 percent slopes	1,640	.34
Olete-Alderwood complex, 0 to 30 percent slopes	1,830	.38

TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent	Soil	Acres	Percent
Olete-Clallam complex, 0 to 30 percent slopes	490	0 10	Solleks-Hoko association, steep	4,020	0.84
Olete-Hoodsport complex, 0 to 30 percent slopes	3,600	75	Swantown gravelly sandy loam, 0 to 8 percent slopes	2,420	.50
Olete-Rock outcrop complex, 50 to 90 percent slopes	730	15	Swantown gravelly loam, 0 to 8 percent slopes	1,400	29
Phelan gravelly silt loam, 30 to 80 percent slopes	9,320	1 94	Swantown-Alderwood complex, 0 to 15 percent slopes	970	.20
Queets silt loam	5,520	1 15	Tealwhit silty clay loam, 0 to 8 percent slopes	6,820	1 42
Quilcene silt loam, 0 to 15 percent slopes	1,550	32	Tidal marsh	580	.12
Quilcene silt loam, 15 to 30 percent slopes	1,100	.23	Tisch silt loam	250	05
Quilcene silt loam, 30 to 50 percent slopes	600	.13	Townsend fine sandy loam, 0 to 15 percent slopes	620	.13
Riverwash	3,800	.79	Townsend gravelly loam, 0 to 15 percent slopes	390	.08
Rock land	1,000	21	Triton very gravelly loam, 0 to 30 percent slopes	2,360	.49
Rough broken land	290	.06	Triton very gravelly loam, 50 to 70 percent slopes	3,930	.82
San Juan gravelly sandy loam, 0 to 8 percent slopes	1,040	22	Tukey gravelly loam, 0 to 15 percent slopes	2,440	.51
Sekiu clay	1,530	32	Tukey gravelly loam, 15 to 30 percent slopes	400	08
Semiahmoo muck	1,440	30	Wapato silty clay loam	750	.16
Semiahmoo muck, moderately shallow variant	420	.09	Whidbey gravelly sandy loam, 0 to 15 percent slopes	4,745	.99
Semiahmoo muck, shallow variant	450	09	Whidbey gravelly sandy loam, 15 to 30 percent slopes	460	09
Sinclair gravelly sandy loam, 0 to 15 percent slopes	12,520	2 61	Total land area	479,925	100.0
Sinclair gravelly sandy loam, 15 to 30 percent slopes	5,940	1.24	Water area	39,470	
Snahopish silty clay loam, 0 to 30 percent slopes	7,550	1 57	Total	519,395	
Snohomish silty clay loam	220	.05			
Solleks channery silty clay loam, 30 to 50 percent slopes	35,540	7 41			

are on terraces, canyon slopes, and ocean bluffs. Slopes range from 0 to 50 percent. Native vegetation consists mainly of Douglas-fir, western redcedar, red alder, willow, and bigleaf maple. Annual precipitation ranges from 18 to 25 inches The average annual air temperature is 50°F. The above 32°F growing season ranges from about 240 to 270 days, and the above 28°F growing season ranges from about 300 to 330 days. These soils are associated mainly with Clallam, Dick, and Hoypus soils.

In a representative profile in a wooded area, organic litter covers the surface. The upper 3 inches of the soil is dark-brown silt loam. Below this, to a depth of 9 inches, is grayish-brown, faintly mottled silt loam. Between depths of 9 and 29 inches is grayish-brown, faintly mottled silty clay loam. This is underlain by grayish-brown silty clay loam and gravelly silty clay loam that extends to a depth of 60 inches.

Most of the acreage of Agnew soils has been cleared. The soils are used mainly for permanent pasture, part-time diversified farming, and rural development. The steeper Agnew soils are wooded.

Agnew silt loam, 0 to 8 percent slopes (AgB).—This nearly level to gently sloping soil is either adjacent to ocean bluffs or in valley areas formerly occupied by shallow glacial lakes.

Representative profile south of road in NE¼NE¼SE¼ sec. 33, T. 29 N., R. 1 W.:

O1—2½ inches to ¾ inch, needles, leaves, twigs, bark, and moss.
O2—¾ inch to 0, dark reddish-brown (5YR 2/2) decomposing organic litter, strongly acid, abrupt, smooth boundary.
A2—0 to 3 inches, dark-brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate, medium and coarse, granular structure and weak, medium, subangular blocky, hard, friable, sticky, plastic, common fine, medium, and coarse roots; 6 to 8 percent fine, dark-brown shot, medium acid, clear, smooth boundary. (2 to 4 inches thick)
B1—3 to 9 inches, grayish-brown (2.5Y 5/2) silt loam, light gray (2.5Y 7/2) dry, few medium, faint, olive-brown (2.5Y 4/4) mottles; weak, fine and medium, prismatic structure, very hard, firm, sticky, plastic, common fine and medium roots; 2 to 4 percent fine dark-brown shot, slightly acid, clear, wavy boundary (5 to 8 inches thick)
B21tg—9 to 18 inches, grayish-brown (2 5Y 5/2) silty clay loam, light gray (2.5Y 7/2) dry, common medium, faint, olive-brown (2.5Y 4/4) mottles; weak, coarse, prismatic structure and moderate, fine and medium, subangular blocky; very hard, firm, sticky, plastic; few medium and large roots, common thin, continuous clay films on peds and in pores, slightly acid, clear, wavy boundary. (8 to 12 inches thick)
B22tg—18 to 29 inches, grayish-brown (2.5Y 5/2) silty clay loam, light gray (2.5Y 7/2) dry, weak, medium, subangular blocky structure, weak laminations showing in peds; olive-brown (2 5Y 4/4) colors on some peds and laminated faces, very hard, firm, sticky, plastic, few medium and large roots; common thin continuous clay films in pores; slightly acid, clear, smooth boundary. (10 to 14 inches thick)
C1—29 to 52 inches, grayish-brown (10YR 5/2) silty clay loam, light gray (10YR 7/2) dry; massive, moderate, fine and medium laminations; very dark brown (10YR 2/2) stains; extremely hard, very firm, sticky, plastic, no roots; slightly acid, gradual, wavy boundary (20 to 26 inches thick)
C2—52 to 60 inches, grayish-brown (10YR 5/2) gravelly silty clay loam, light gray (10YR 7/2) dry; massive, moderate, medium laminations; extremely hard, very firm, very sticky, very plastic, no roots; neutral.

The A2 horizon ranges from grayish-brown to gray in color and from silt loam to silty clay loam in texture In places the B2 horizons have laminations of silt loam and silty clay The C horizons are 10 to 50 percent rounded glacial pebbles and contain laminated strata of fine sandy loam, silt loam, and silty clay.

Included with this soil in mapping are small areas of moderately coarse textured, gravelly soils that formed in glacial till and outwash.

This soil is somewhat poorly drained. Permeability is moderately slow. Roots penetrate to a depth of more than

60 inches. The soil holds 10 or more inches of water available for plants. Runoff is slow, and the hazard of water erosion is slight. A seasonal water table is at a depth of 1 to 2 feet.

About 60 to 70 percent of the acreage is used for crops. Pasture, hay, and silage from mixed grasses and legumes are the principal crops. A variety of garden vegetables, berries, and tree fruits may be grown. Capability unit IIIw-1; woodland group 3d2.

Agnew silt loam, 30 to 50 percent slopes (AgE).—This soil is mainly along ocean bluffs or canyon sidewalls. The subsoil in many places contains strata of silty clay loam, fine sandy loam, silty clay, and sandy clay loam.

Runoff is rapid, and the hazard of water erosion is severe. Most areas of this soil are wooded. When used for building sites, the soil often slides when saturated. Capability unit VIe-1; woodland group 3d2.

Ahl Series

The Ahl series consists of well-drained, very gravelly loam soils underlain by basalt bedrock at a depth of 24 to 40 inches. These soils are on mountainous terrain. Slopes range from 50 to 90 percent. Elevation ranges from 800 to about 3,000 feet. These soils formed in weathered basalt under a dominantly coniferous forest of Douglas-fir, western hemlock, and western redcedar. Annual precipitation is 60 to 80 inches. The average annual air temperature is about 49°F. The above 32°F growing season ranges from 150 to 190 days, and the above 28°F growing season ranges from 180 to 230 days. These soils are associated mainly with Grove, Lystair, Olete, and Triton soils.

In a representative profile a thin layer of organic litter covers the surface. The upper 3 inches of the soil is dark reddish-brown very gravelly loam. Below this, to a depth of 30 inches, is very gravelly loam that is dark red in the upper part and reddish brown in the lower part. Beneath this, and extending to a depth of 38 inches, is mostly angular basalt pebbles and fractured, weathered basalt. Basalt bedrock is at a depth of 38 inches.

Ahl soils are used mainly for tree production and for wildlife habitat and recreation areas.

Ahl very gravelly loam, 50 to 70 percent slopes (AhF).—This very steep soil is in the mountains.

Representative profile in SE¼NW¼SE¼ sec. 34, T. 27 N., R. 2 W., 1.2 miles south of U.S. Highway 101 along Mt. Walker Road, 15 feet east of road.

O1—3 inches to 1 inch, needles, leaves, twigs, bark, moss, and fragments of wood

O2 —1 inch to 0, decomposing organic litter.

B21ir—0 to 3 inches, dark reddish-brown (5YR 3/4) very gravelly loam, reddish brown (2 5YR 5/4) dry; weak, fine and very fine, granular structure; soft, very friable, slightly sticky, plastic, smeary; many fine, medium, and large roots; 55 percent angular basalt pebbles; medium acid; clear, wavy boundary. (2 to 6 inches thick)

B22ir—3 to 20 inches, dark-red (2 5YR 3/6) very gravelly loam, reddish brown (2.5YR 5/4) dry; weak, fine, granular and subangular blocky structure, soft, very friable, slightly sticky, plastic, smeary, many fine, medium, and large roots; 55 percent angular basalt pebbles and 5 percent rounded pebbles; medium acid; gradual, wavy boundary. (10 to 18 inches thick)

B3—20 to 30 inches, reddish-brown (5YR 4/4) very gravelly loam, light reddish brown (5YR 6/4) dry; massive; soft, friable, nonsticky, nonplastic, smeary; common fine roots; 70 percent angular basalt pebbles, slightly acid; gradual, wavy boundary. (8 to 12 inches thick)

C—30 to 38 inches, 90 percent fractured basalt bedrock. Material in voids is reddish-brown (5YR 4/4) very gravelly loam, light reddish brown (5YR 6/4) dry; massive; slightly acid, gradual, wavy boundary (4 to 12 inches thick)

R—38 inches, basalt bedrock.

Depth to basalt bedrock ranges from 24 to 40 inches. The Bir horizons are very gravelly loam or very gravelly silt loam. The C horizon is more than 80 percent fractured basalt bedrock.

Included with this soil in mapping are small areas of Rock outcrop and of Triton soils.

This soil is well drained. Permeability is moderate. Roots penetrate to the bedrock. This soil holds 2 to 4 inches of water available for plants. Runoff is very rapid, and the hazard of erosion is very severe.

This soil is used mainly for tree production and for wildlife habitat and recreation areas. Capability unit VIIe-1; woodland group 3d2.

Ahl-Rock outcrop complex, 50 to 90 percent slopes (AkF).—This mapping unit is made up of about 50 to 70 percent Ahl very gravelly loam. It is 30 to 50 percent Rock outcrop and stony areas. The Ahl soil is 24 to 30 inches deep in most places.

Almost all the acreage of the complex is used for tree production and for wildlife habitat and recreation areas. Capability unit VIIs-1; woodland group 4x2.

Alderwood Series

The Alderwood series consists of moderately well drained soils that have a very slowly permeable cemented layer at a depth of 20 to 40 inches. Slopes range from 0 to 50 percent. Elevation ranges from 100 to 800 feet. These soils formed in glacial till under a forest of mixed coniferous and broadleaved vegetation. Annual precipitation ranges from 25 to 50 inches. The average annual air temperature is about 49°F. The above 32°F growing season ranges from 160 to 260 days, and the above 28°F growing season ranges from 220 to 320 days. These soils are associated mainly with Beausite, Casey, Clallam, Dick, Everett, Hoypus, Indianola, Sinclair, and Whidbey soils.

In a representative profile a thin layer of organic litter covers the surface. The top 1 inch of the soil is very dark grayish-brown gravelly fine sandy loam. Below this, to a depth of 12 inches, is dark yellowish-brown gravelly sandy loam. Beneath this layer, and continuing to a depth of 30 inches, is gravelly sandy loam that is brown in the upper part and dark grayish brown and prominently mottled in the lower part. The next layer is a dark grayish-brown cemented layer that formed in very compact glacial till. Rounded pebbles, cobblestones, and stones are on the surface and throughout the profile.

Alderwood soils are used mainly for tree production and for wildlife habitat and recreation areas. Less than 30 percent of the acreage is used for growing pasture plants, hay plants, and diversified farm crops.

Alderwood gravelly sandy loam, 0 to 15 percent slopes (AlC).—This nearly level to rolling soil is on glacial terraces. In most places the slope is 5 to 10 percent.

Representative profile 100 yards west of house, southwest side of Beausite Lake; SE¼NE¼SE¼ sec. 28, T. 29 N., R. 1 W.:

O1—1½ inches to ½ inch, needles, leaves, bark, and fragments of wood.

O2—½ inch to 0, black (5YR 2/1) partly decayed leaves, needles, bark, and fragments of wood; medium acid; abrupt, wavy boundary. (½ to 1½ inches thick)

A2—0 to 1 inch, very dark grayish-brown (10YR 3/2) gravelly fine sandy loam, pale brown (10YR 6/3) dry; weak, very fine,

granular structure, soft, very friable, nonsticky and nonplastic; many fine and medium roots; 25 percent pebbles; medium acid; clear, smooth boundary (½ to 1½ inches thick)

B21ircn—1 to 6 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam, pale brown (10YR 6/3) dry; weak, fine, granular structure, slightly hard, friable, slightly sticky and slightly plastic, many fine and medium roots, common hard iron-manganese concretions, 40 percent gravel; medium acid; gradual, wavy boundary. (4 to 6 inches thick)

B22ircn—6 to 12 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam, pale brown (10YR 6/3) dry, weak, fine, subangular blocky structure, slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots, common hard iron-manganese concretions; 40 percent pebbles; slightly acid, clear, wavy boundary. (5 to 7 inches thick)

B3—12 to 21 inches, brown (10YR 4/3) gravelly sandy loam, pale brown (10YR 6/3) dry, weak, fine, subangular blocky structure, slightly hard, friable, slightly sticky, slightly plastic, many fine and medium roots, 45 percent gravel; slightly acid; clear, smooth boundary. (6 to 12 inches thick)

C1 21 to 30 inches, dark grayish-brown (10YR 4/2) gravelly sandy loam, light gray (10YR 7/2) dry; many medium, prominent, yellowish-red (5YR 4/6) mottles, massive; hard, firm, slightly sticky, slightly plastic; few fine and medium roots; 45 percent gravel, medium acid, gradual, wavy boundary. (4 to 16 inches thick)

C2sim—30 to 48 inches, dark grayish-brown (10YR 4/2) weakly cemented gravelly sandy loam, light gray (10YR 7/2) dry, many coarse, prominent, yellowish-red (5YR 4/6) mottles, massive, extremely hard, extremely firm, no roots, slightly acid (10 to 18 inches thick)

C3—48 inches, very compact gravelly sandy loam glacial till. (Many feet thick)

The depth to the cemented layer ranges from 20 to 40 inches. The A2 and B2ircn horizons range from very dark grayish brown to dark yellowish brown. Their content of coarse fragments ranges from 20 to 50 percent and averages more than 35 percent. In places the upper part of the C1 horizon is compact gravelly loamy sand. Few to many hard iron-manganese concretions are in the A2, B2ircn, and B22ircn horizons.

Small areas of sandy, very gravelly, or cobbly soils are included with this soil in mapping.

This soil is moderately well drained. Permeability above the cemented layer is moderately rapid Roots penetrate to the cemented layer and flatten out on top of it. A perched water table is above the cemented layer during the winter months This soil holds 2 to 4 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This soil is used for permanent pasture of mixed grasses and legumes. Both hay and silage are commonly produced. Small grains, vegetables, berries, and fruit trees are also grown. Capability unit IVe-1; woodland group 3d2.

Alderwood gravelly sandy loam, 15 to 30 percent slopes (AlD). —This moderately steep soil is in places where the rolling glacial upland terraces converge toward ravines and steep drainageways.

Runoff is medium to rapid, and the hazard of water erosion is moderate to severe. This soil is used mainly for tree production and for wildlife habitat and recreation areas. It is also suited to permanent hay and pasture crops. Capability unit VIe-1; woodland group 3d2.

Alderwood gravelly sandy loam, 30 to 50 percent slopes (AlE).—This steep soil is on glaciated uplands, generally in small areas along steep morainal margins or canyon sidewalls. On the upper third of the slopes, the surface layer and subsoil are often 20 to 24 inches thick over the cemented layer. Along the bottom slopes, depth to the cemented layer is 30 to 40 inches.

Included with this soil in mapping are small areas of Alderwood gravelly sandy loam and Alderwood gravelly loam, 15 to 30 percent slopes, as well as small areas of Everett, Indianola, Hoypus, Sinclair, and Whidbey soils, 15 to 30 percent slopes.

Runoff is rapid, and the hazard of water erosion is severe. This soil is used for tree production and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d2.

Alderwood gravelly loam, 0 to 15 percent slopes (AmC).—This nearly level to rolling soil is on glacial terraces. The surface layer and subsoil are gravelly loam.

Included with this soil in mapping are small tracts having shale or sandstone at a depth of 20 to 36 inches.

Permeability is moderate. This soil holds 3 to 6 inches of water available for plants.

This soil is used mainly for tree production and for wildlife habitat and recreation areas. Capability unit IVe-1; woodland group 3d2.

Alderwood gravelly loam, 15 to 30 percent slopes (AmD).—This moderately steep soil is in areas where the rolling upland glacial terraces converge with the steep drainageway ravines. The surface layer and subsoil are gravelly loam.

This soil holds 3 to 6 inches of water available for plants. Permeability is moderate. Runoff is medium to rapid, and the hazard of erosion is moderate to severe.

This soil is used mainly for tree production and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d2.

Alderwood-Quilcene complex, 0 to 15 percent slopes (AuC).—This mapping unit is made up of about 60 percent Alderwood gravelly sandy loam, 0 to 15 percent slopes, and about 30 percent Quilcene silt loam, 0 to 15 percent slopes. The mostly rolling Alderwood soil is on glacial moraines. The nearly level to strongly sloping Quilcene soil is mostly in areas adjacent to the moraines. About 10 percent of the acreage is Everett, Hoypus, and Indianola soils.

Most of this acreage is wooded. A small acreage has been cleared and planted to pasture. Capability unit IVe-1; woodland group 3d2.

Beausite Series

The Beausite series consists of well-drained soils underlain by strongly cemented sandstone conglomerate at a depth of 20 to 36 inches. They are on the sides of valleys, mostly south and southeast of Discovery Bay in the northeastern part of Jefferson County. Slopes range from 0 to 50 percent. Elevation ranges from 50 to 1,500 feet. These soils formed under a dominantly coniferous forest in weathered conglomerate consisting of mixed acid and basic rocks. Annual precipitation ranges from 30 to 40 inches. The average annual air temperature is about 50°F. The above 32°F growing season ranges from about 220 to 250 days, and the above 28°F growing season ranges from about 270 to 300 days. These soils are associated mainly with Alderwood, Everett, Indianola, Quilcene, and Sinclair soils.

In a representative profile a thin layer of organic litter covers the surface. The upper 22 inches of the soil is gravelly sandy loam that is dark brown in the upper part and dark yellowish brown in the lower part. Below this, to a depth of 33 inches, is brown and grayish-brown very gravelly sandy loam. Beneath this layer is strongly cemented, very gravelly sandstone conglomerate.

Beausite soils are used mainly for tree production and for wildlife habitat and recreation areas.

Beausite gravelly sandy loam, 15 to 30 percent slopes (BaD).—This moderately steep soil is mostly along the sides of valleys.

Representative profile 300 yards south and 200 yards west of the northeast corner of the SW¼SW¼ sec. 36, T. 29 N., R. 2 W.:

O1—2¾ inches to ¾ inch, needles, leaves, twigs, bark, moss, and fragments of wood.
O2—¾ inch to 0, black (5YR 2/1) decomposing forest litter, medium acid
A1—0 to 2½ inches, dark-brown (7 5YR 3/2) gravelly sandy loam, brown (7 5YR 5/2) dry, weak, fine and medium, granular structure, slightly hard, very friable, nonsticky, nonplastic; many fine roots; 20 percent fine round pebbles and 10 percent coarse round pebbles, medium acid, clear, wavy boundary. (2 to 5 inches thick)
B21ir—2½ to 6 inches, dark-brown (7.5YR 4/4) gravelly sandy loam, light brown (7.5YR 6/4) dry, weak, medium and coarse, subangular blocky structure, slightly hard, very friable, nonsticky, nonplastic, many fine and medium roots, 23 percent fine round pebbles and 12 percent coarse round pebbles; medium acid, gradual, wavy boundary. (3 to 10 inches thick)
B221ir—6 to 14 inches, dark-brown (10YR 4/3) gravelly sandy loam, pale brown (10YR 6/3) dry, weak, coarse, subangular blocky structure, slightly hard, friable, nonsticky, nonplastic; many fine and medium roots, 25 percent fine round pebbles and 15 percent coarse round pebbles, medium acid; gradual, wavy boundary. (6 to 10 inches thick)
B3—14 to 22 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam, light yellowish brown (10YR 6/4) dry, massive, hard, firm, nonsticky, nonplastic, common small and medium roots, 30 percent fine round pebbles and 15 percent coarse round pebbles; slightly acid; gradual, irregular boundary. (4 to 10 inches thick)
C—22 to 33 inches, brown (10YR 5/3) and grayish-brown (10YR 5/2) very gravelly sandy loam, very pale brown (10YR 7/4) dry, massive, very hard, very firm, nonsticky, nonplastic, few fine roots; 40 percent fine round pebbles and 15 percent coarse round pebbles, slightly acid, clear, irregular boundary. (4 to 12 inches thick)
R—33 inches, grayish-brown (10YR 5/2) and brown (10YR 5/3) conglomerate

The A1 horizon is gravelly to very gravelly loam or sandy loam. The depth to conglomerate bedrock ranges from 20 to 36 inches. In places this soil has a thin A2 horizon. The Bir horizons are gravelly or very gravelly sandy loam. The C horizon is gravelly or very gravelly sandy loam. It is weakly cemented in places.

Included with this soil in mapping are small areas of Rock outcrop and areas where water moves laterally on top of the bedrock during the rainy season.

This soil is well drained. Permeability is moderately rapid. Roots penetrate to a depth of 20 to 36 inches. This soil holds 2 to 3 inches of water available for plants. Runoff is medium to rapid, and the hazard of water erosion is moderate to severe.

About 90 percent of the acreage of this soil is wooded. The rest has been cleared and planted to pasture. Capability unit VIe-1; woodland group 3d2.

Beausite gravelly sandy loam, 30 to 50 percent slopes (BaE).—This steep soil is on rough, broken terrain. The soil is shallower and there are more outcrops of bedrock than in Beausite gravelly sandy loam, 15 to 30 percent slopes, particularly along the crests of ridges and upper part of the slopes.

Runoff is rapid, and the hazard of water erosion is severe. All the acreage of this soil is wooded. Capability unit VIe-1; woodland group 3d2.

Beausite-Alderwood complex, 0 to 30 percent slopes (BdD).—This mapping unit is made up of about 60 percent Beausite gravelly sandy loam, 15 to 30 percent slopes, and 30 percent Alderwood gravelly sandy loams having slopes of 0 to 30 percent. The remaining 10 percent of the acreage is Everett, Indianola, and Quilcene soils.

Runoff is slow to rapid, and the hazard of water erosion is slight to severe. About 85 percent of the acreage of this complex is wooded. The rest has been cleared and planted to pasture. Capability unit VIe-1; woodland group 3d2.

Beausite-Alderwood complex, 30 to 50 percent slopes (BdE).—This mapping unit is on rough, broken terrain. It is about 70 percent Beausite gravelly sandy loam, 30 to 50 percent slopes, and 20 percent Alderwood gravelly sandy loam, 30 to 50 percent slopes. The remaining 10 percent of the acreage is Everett and Indianola soils and rock outcrops.

Runoff is rapid, and the hazard of water erosion is severe. Nearly all of the acreage of this complex is wooded. Capability unit VIe-1; woodland group 3d2.

Beausite-Rock outcrop complex, 0 to 50 percent slopes (BeE).—This mapping unit is made up of 70 to 80 percent Beausite gravelly sandy loam having slopes of 15 to 50 percent. It is 20 to 30 percent Rock outcrop and areas of stony rubble 6 to 24 inches deep over rock.

Runoff is slow to rapid, and the hazard of water erosion is slight to severe. All of the acreage of this complex is wooded. Capability unit VIs-1; woodland group 3d2.

Belfast Series

The Belfast series consists of well-drained soils on flood plains. Slopes range from 1 to 2 percent. Elevation ranges from 30 to about 300 feet. These soils formed in alluvium under a forest consisting mostly of Douglas-fir, western redcedar, Sitka spruce, red alder, maple, willow, cottonwood, salmonberry, and swordfern. Annual precipitation ranges from 30 to 70 inches. The average annual air temperature is about 50°F. The above 32°F growing season ranges from 160 to 200 days, and the above 28°F growing season ranges from 210 to 250 days. These soils are associated mainly with Lummi and Swantown soils.

In a representative profile in a typical cultivated area, the upper 15 inches is silt loam that is very dark grayish brown in the upper part and dark grayish brown in the lower part. Below this are dark grayish-brown stratified layers ranging in texture from fine sandy loam to silt loam. All soil layers are slightly acid except the surface layer, which is medium acid.

Belfast soils are used for growing pasture plants, hay, home garden crops, bulbs, rhododendrons, and azaleas and for summer homesites.

Belfast silt loam (Bg).—This nearly level soil is on flood plains. Most of it is subject to overflow about once every 10 to 30 years. Most slopes are 1 to 2 percent.

Representative profile in the lower Duckabush River Valley, 0.3 mile west of U.S. Highway 101 and 200 feet south of Duckabush Road in the northeast corner of the SE¼SW¼ sec. 16, T. 25 N., R. 2 W.:

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry, moderate, medium, granular structure; slightly hard, friable, nonsticky, slightly plastic; many roots; medium acid; abrupt, wavy boundary. (4 to 8 inches thick)
B2—5 to 12 inches, dark grayish-brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; moderate, medium and coarse, granular structure; slightly hard, friable, nonsticky, slightly plastic; many roots, slightly acid, clear, smooth boundary. (4 to 12 inches thick)
B3—12 to 15 inches, dark grayish-brown (2.5Y 4/2) heavy silt loam, light brownish gray (2.5Y 6/2) dry; weak, medium, sub-

angular blocky structure, hard, friable, slightly sticky, slightly plastic, common roots; slightly acid; clear, wavy boundary. (2 to 8 inches thick)

IIC1—15 to 20 inches, dark grayish-brown (2 5Y 4/2) fine sandy loam, light brownish gray (2 5Y 6/2) dry, massive; soft, friable, nonsticky, nonplastic, common roots, slightly acid, clear, smooth boundary. (4 to 8 inches thick)

IIIC2—20 to 28 inches, dark grayish-brown (2 5Y 4/2) loam, light brownish gray (2.5Y 6/2) dry; massive; slightly hard, friable, slightly sticky, slightly plastic, few roots, slightly acid, clear, smooth boundary. (6 to 10 inches thick)

IVC3—28 to 31 inches, dark grayish-brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry, massive, slightly hard, friable, nonsticky, slightly plastic, few roots, slightly acid, clear, wavy boundary. (2 to 5 inches thick)

VC4—31 to 48 inches, dark grayish-brown (2 5Y 4/2) fine sandy loam, light brownish gray (2 5Y 6/2) dry, massive, slightly hard, friable, nonsticky, slightly plastic, few roots; slightly acid, clear, smooth boundary. (10 to 20 inches thick)

VIC5—48 to 60 inches, dark grayish-brown (2.5Y 4/2) silt loam, light brownish gray (2 5Y 6/2) dry; massive, hard, firm, sticky, plastic, few roots, slightly acid

The B horizons are silt loam, loam, or fine sandy loam. The C horizons are highly stratified fine sandy loam, loam, silt loam, sandy loam, and loamy sand. All of the horizons contain gravel or cobbles in places.

This soil is well drained. Permeability is moderate. Roots penetrate to a depth of more than 60 inches. This soil holds about 9 to 11 inches of water available for plants. Runoff is very slow, and the hazard of water erosion is none to slight. This soil is subject to overflow in places.

About 65 to 75 percent of the acreage of this soil is used for growing pasture, hay, and fruit and vegetable crops. Wooded areas are used as a source for woodland products, for wildlife habitat and recreation areas, and for rural homesites. Capability unit IIw-3; woodland group 3o2.

Belfast fine sandy loam (Bf).—This soil has a surface layer of fine sandy loam 4 to 8 inches thick. The subsoil is sandy loam 4 to 12 inches thick. Gravel or cobbles are throughout the entire profile. The layers below a depth of 40 inches may be sand or loamy sand

Included with this soil in mapping are small areas that have sand, loamy sand, or loam layers. Also included are small areas that are very gravelly and small areas that are poorly drained.

This soil holds 6 to 8 inches of water plants can use. It is used mainly for production of trees, for wildlife habitat and recreation areas, and for summer homesites. Cultivated areas are used for growing pasture grasses, alfalfa, strawberries, and cane fruits. Capability unit IIw-3; woodland group 4w2.

Belfast silt loam, heavy variant (Bh).—This nearly level soil is on flood plains. The upper 26 inches is dominantly dark-brown or dark yellowish-brown, slightly acid to neutral silt loam. Below this, to a depth of more than 60 inches, is mostly dark grayish-brown or dark-brown, neutral heavy silt loam and silty clay loam mottled with dark red and dark reddish brown.

Included with this soil in mapping are small areas having poor drainage.

This soil is moderately well drained. Permeability is moderately slow. This soil holds about 11 to 13 inches of water available for plants. A seasonal water table is at a depth of 2 to 4 feet.

Most of the acreage of this soil is used for permanent pasture, hay, or silage and for many berry, fruit, and vegetable crops. Capability unit IIw-1; woodland group 3o2.

Belfast silt loam, wet variant (Bk).—This nearly level soil is on flood plains. The upper 9 inches of the soil is dominantly very dark brown or very dark grayish-brown, slightly acid or neutral silt loam. Below this, to a depth of 20 inches, is dark-gray or dark grayish-brown, slightly acid or neutral silt loam, fine sandy loam, or loam mottled with strong brown and dark yellowish brown. Beneath this, and extending to a depth of more than 40 inches, is dominantly dark-gray or olive-gray, neutral or slightly acid, stratified fine sandy loam, silt loam, and clay loam. Gravel content ranges from 2 to 25 percent, increasing with depth.

Included with this soil in mapping are small areas where the surface layer is fine sandy loam or loam.

This soil is poorly drained. Permeability is moderately slow. The soil holds 10 to 12 inches of water available for plants. A seasonal water table is at a depth of ½ to 1 foot.

Most of the acreage of this soil is in pasture, but small areas are used for growing diversified home garden crops. Capability unit IIw-1; woodland group 4w2

Belfast silty clay loam, wet variant (Bm).—This nearly level soil is on flood plains. The upper 20 inches of the soil is silty clay loam and sandy clay loam Below this, to a depth of 60 inches, is dominantly dark-gray or olive-gray, neutral or slightly acid, stratified fine sandy loam, silt loam, and clay loam.

This soil is poorly drained. Permeability is moderately slow. The soil holds 10 to 12 inches of water available for plants. A seasonal water table is at a depth of ½ to 1 foot.

Most of the acreage of this soil is used for pasture. Capability unit IIIw-1; woodland group 4w2.

Calawah Series

The Calawah series consists of moderately well drained soils on coastal plains or glacial marine terraces, mostly along the coastal strip. Slopes range from 0 to 8 percent. Elevation is about 600 feet. These soils formed in glacial and marine sediments and highly weathered soft shale and sandstone materials. Native vegetation consists mostly of western hemlock, western redcedar, Sitka spruce, Pacific silver fir, red alder, salmonberry, huckleberry, swordfern, and deerfern. Annual precipitation ranges from 130 to 150 inches. The average annual air temperature is about 49°F. The above 32°F growing season ranges from 170 to 200 days, and the above 28°F growing season ranges from 190 to 220 days. These soils are associated mainly with the Hoko, Kalaloch, Klone, Sekiu, Snahopish, and Tealwhit soils.

In a representative profile a 3- to 4-inch layer of organic litter covers the surface. The upper 8 inches of the soil is dark-brown heavy silt loam. Below this, to a depth of 24 inches, is dark-brown or strong-brown heavy silt loam or light silty clay loam. Beneath this, and extending to a depth of 32 inches, is brown light silty clay loam that has a few grayish-brown and dark-red mottles. The underlying material is olive and light yellowish-brown silty clay loam and light yellowish-brown light silty clay. It extends to a depth of 60 inches.

Calawah soils are used for tree production and for wildlife habitat and recreation areas.

Calawah silt loam, 0 to 8 percent slopes (CGB).—This nearly level to gently sloping or undulating soil is on terraces and coastal plains within several miles of the ocean. In most areas slopes range from 2 to 4 percent.

Representative profile near Goodman Creek logging road in the NE¼NE¼NW¼ sec. 12, T. 27 N., R 14 W., 100 feet east of road and about 2.3 miles southeast of Clallam

County line:

O1—3½ inches to 1 inch, needles, leaves, fragments of wood, and moss.
O2—1 inch to 0, dark reddish-brown (5YR 2/2) decomposing matter, very strongly acid
All—0 to 4 inches, dark-brown (7 5YR 3/2) heavy silt loam, brown (7.5YR 5/2) dry, moderate, medium, granular and weak, fine, subangular blocky structure, slightly hard, friable, slightly sticky, slightly plastic, many fine, medium, and coarse roots, common very fine and fine, soft, iron-manganese concretions; very strongly acid, clear, smooth boundary (3 to 8 inches thick)
A12—4 to 8 inches, dark-brown (7.5YR 3/4) heavy silt loam, brown (7.5YR 5/4) dry, weak, coarse, subangular blocky structure, hard, friable, slightly sticky, slightly plastic, many fine, medium, and coarse roots, few very fine and fine, iron-manganese concretions; very strongly acid, clear, smooth boundary. (3 to 10 inches thick)
B21—8 to 16 inches, dark-brown (7.5YR 4/2) heavy silt loam, pinkish gray (7 5YR 6/2) dry, moderate, medium, subangular blocky structure, hard, friable, slightly sticky, slightly plastic; many fine and medium roots, very strongly acid, clear, smooth boundary. (6 to 10 inches thick)
B22—16 to 24 inches, strong-brown (7.5YR 5/6) light silty clay loam, reddish yellow (7.5YR 7/6) dry, weak, medium, prismatic structure that parts to moderate, very fine and fine, subangular blocky, very hard, friable, sticky, plastic; common fine and medium roots, very strongly acid, clear, smooth boundary. (6 to 10 inches thick)
B23—24 to 32 inches, brown (10YR 5/3) light silty clay loam, very pale brown (10YR 7/3) dry, few, fine, distinct grayish-brown (2.5Y 5/2) and few, fine, prominent dark-red (2.5YR 3/6) mottles, weak, medium, prismatic structure that parts to moderate, very fine and fine, subangular blocky, very hard, firm, sticky, plastic, few fine roots, very strongly acid, smooth boundary. (6 to 10 inches thick)
C1—32 to 40 inches, olive (5Y 5/3) light silty clay loam, pale yellow (5Y 7/3) dry; common, fine, prominent dark-red (2 5YR 3/6) mottles, moderate, medium, platy structure; very hard, firm, sticky, plastic; few fine roots, very strongly acid, gradual, smooth boundary. (6 to 10 inches thick)
C2—40 to 48 inches, light yellowish-brown (2.5Y 6/4) heavy silty clay loam, pale yellow (2 5Y 8/4) dry, common, fine, distinct brownish-yellow (10YR 6/8) mottles, massive, very hard, firm, very sticky, plastic, few fine roots, very strongly acid, gradual, smooth boundary (5 to 9 inches thick)
C3—48 to 60 inches, light yellowish-brown (2 5Y 6/4) light silty clay, pale yellow (2.5Y 8/4) dry, common, medium, prominent gray (5Y 6/1) mottles and common, medium, distinct brownish-yellow (10YR 6/8) mottles; massive, very hard, firm, very sticky, very plastic; no roots, very strongly acid.

The A horizons are dark reddish-brown or dark-brown, medium or heavy silt loam. The B horizons are dark-brown, strong-brown, dark yellowish-brown, and brown silt loam and silty clay loam. The C horizons are olive, light olive-brown, light yellowish-brown, and light brownish-gray silty clay loam or silty clay. In the flatter areas, where drainage is more restricted, fluctuating high water tables have caused mottles to be more intense and more abundant in the B horizons than elsewhere. In transitional areas between Hoko and Calawah soils, the C horizons include very firm silt loam or gravelly loam having prominent red and reddish-yellow mottles.

Included with this soil in mapping are small areas where the surface layer is clay and silty clay and small areas of very poorly drained soils.

This soil is moderately well drained. Permeability is slow. Roots penetrate to a depth of more than 60 inches. This soil holds 10 or more inches of water available for plants Runoff is slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 2 to 3 feet.

This soil is used mainly for production of trees and for recreation areas, rural homesites, and wildlife habitat. Capability unit VIe-1; woodland group 3o1.

Calawah-Snahopish association, moderately steep (CND).—This mapping unit is made up of about 60 percent Calawah silt loam, 0 to 8 percent slopes, and 40 percent Snahopish silty clay loam, 0 to 30 percent slopes. The Calawah soil is gently sloping to undulating, and the Snahopish soil is mostly rolling to moderately steep.

This association is used mainly for production of trees and for wildlife habitat and recreation areas Capability unit VIe-1; woodland group 3o1.

Calawah-Tealwhit association, gently rolling (CVB).—This mapping unit is made up of about 65 percent Calawah silt loam, 0 to 8 percent slopes, and 35 percent Tealwhit silty clay loam, 0 to 8 percent slopes The Calawah soil is undulating and gently rolling, and the Tealwhit soil is nearly level.

Between areas of the Calawah and Tealwhit soils are small areas of a somewhat poorly drained soil that has a thick, dark reddish-brown and very dark brown surface layer and a firm, light olive-gray subsoil.

This association is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 4w1.

Carlsborg Series

The Carlsborg series consists of somewhat excessively drained soils on plains and terraces. Slopes range from 0 to 30 percent. Elevation ranges from slightly above sea level to about 500 feet. These soils formed in glacial outwash. Native vegetation consists mainly of Douglas-fir, western hemlock, white pine, madrone, rhododendron, salal, huckleberry, Oregon grape, bracken, and perennial grasses. Annual precipitation ranges from 26 to 55 inches. The average annual air temperature is about 50°F. The above 32°F growing season ranges from 230 to 250 days, and the above 28°F growing season ranges from 280 to 300 days. These soils are associated mainly with Alderwood, Cassolary, Everett, Hoypus, Indianola, Kitsap, and Sinclair soils.

In a representative profile a 2- to 3-inch layer of organic litter in varying stages of decay covers the surface. The upper 18 inches mostly dark brown is gravelly loamy sand. Below this, to a depth of 60 inches are layers of dark-gray gravelly and very gravelly sand and dark-gray to dark grayish-brown loamy sand. Cobblestones are scattered on the surface and are throughout the profile.

Most areas of the Carlsborg soils are used mainly for production of trees.

Carlsborg gravelly loamy sand, 0 to 15 percent slopes (CaC).—This nearly level to rolling soil is on glacial outwash plains and terraces In most places slopes range from 4 to 10 percent.

Representative profile in NW¼SE¼SE¼ sec. 33, T. 28 N., R. 1 E., 100 yards north of State Highway 104:

O1—2½ inches to 1 inch, leaves, needles, and twigs
O2—1 inch to 0, black (5YR 2/1) decomposed organic matter; strongly acid.
A2—0 to 1 inch, dark grayish-brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry, massive, soft, very friable, nonsticky, nonplastic, many fine roots, 14 percent fine gravel, medium acid; clear, wavy boundary. (½ to 1½ inches thick)
B21ir—1 to 8 inches, dark-brown (10YR 4/3) gravelly loamy sand, pale brown (10YR 6/3) dry, weak, fine and medium, granular structure, soft, very friable, nonsticky, nonplastic; many fine and medium roots, 35 percent gravel and cobbles, medium acid, clear, wavy boundary. (6 to 10 inches thick)
B22ir—8 to 18 inches, dark-brown (10YR 4/3) gravelly loamy sand, pale brown (10YR 6/3) dry; weak, fine and medium, subangular blocky structure, soft, very friable, nonsticky, nonplastic; many fine and medium roots; 35 percent gravel

and cobbles; medium acid, clear, wavy boundary. (8 to 12 inches thick)

C1 18 to 30 inches, dark-gray (10YR 4/1) gravelly medium sand, gray (10YR 6/1) dry; single grained, loose, nonsticky, nonplastic, common fine and medium roots; 45 percent gravel and cobbles; medium acid, clear, wavy boundary. (10 to 15 inches thick)

IIC2—30 to 39 inches, dark-gray (10YR 4/1) very gravelly coarse sand, gray (10YR 6/1) dry; single grained; loose, nonsticky, nonplastic, 55 percent gravel and cobbles; medium acid; abrupt, wavy boundary. (8 to 13 inches thick)

IIIC3 39 to 60 inches, dark grayish-brown (10YR 4/2) gravelly loamy sand, light brownish gray (10YR 6/2) dry, massive, soft, very friable, nonsticky, nonplastic, 30 percent gravel, slightly acid.

The B2ir horizons range from dark brown to dark yellowish brown. The C horizons are dark-gray or dark grayish-brown, gravelly to very gravelly, coarse and medium sand to a depth of 39 inches. Below this depth is dark grayish-brown gravelly loamy sand or gravelly fine sand. Reaction of this soil ranges from medium acid to slightly acid

Included with this soil in mapping are small areas of Kitsap soils.

This soil is somewhat excessively drained. Permeability is rapid. Roots penetrate to a depth of more than 60 inches. This soil holds 3 to 4 inches of water available for plants. Runoff is slow, and the hazard of water erosion is slight.

This soil is used mainly for production of trees and for recreation areas and wildlife habitat Small areas are used for grass pasture. Capability unit VIs-1; woodland group 3f2.

Carlsborg gravelly loamy sand, 15 to 30 percent slopes (CaD).—This hilly soil is along the glacial outwash moraine terraces where they converge with the steep ravines and drainageways.

Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This soil is used mainly for production of trees and for recreation areas and wildlife habitat. Capability unit VIs-1; woodland group 3f2.

Casey Series

The Casey series consists of somewhat poorly drained soils that are on terraces. Slopes range from 0 to 8 percent. Elevation ranges from slightly above sea level to about 500 feet These soils formed in glacial lacustrine or marine sediments. Native vegetation is Douglas-fir, western redcedar, western hemlock, maple, red alder, willow, red elderberry, salmonberry, and swordfern. Annual precipitation ranges from 18 to 40 inches. The average annual air temperature is 49 to 50°F. The above 32°F growing season ranges from 200 to 250 days, and the above 28°F growing season ranges from 300 to 330 days. These soils are associated with Agnew, Alderwood, Everett, and Indianola soils.

In a representative profile the upper 3 inches of the soil is very dark brown silt loam. Below this, to a depth of 10 inches, is grayish-brown, faintly mottled silt loam. Between depths of 10 and 17 inches is grayish-brown loam that has distinct, dark-brown mottles. Beneath this, and extending to a depth of 33 inches, is gray clay that has distinct, yellowish-brown mottles. Between depths of 33 and 40 inches is dark grayish-brown loamy fine sand. Beneath this is gray, mottled clay that extends to a depth of 60 inches. The soil is slightly acid above a depth of 17 inches and neutral below that depth.

Casey soils are used mainly for pasture, wildlife habitat, recreation areas, and rural homesites. About 50 percent of the acreage is under cultivation.

Casey silt loam, 0 to 8 percent slopes (CeB).—This nearly level to gently sloping soil is on terraces. Most areas are near marine bluffs at elevations of less than 300 feet. Most slopes range from 2 to 5 percent.

Representative profile in NE¼SW¼SW¼ sec 33, T. 3 N., R. 1 E., 50 yards south of farm road midway between Sound View cemetery and the Main Marrowstone Island Road:

A1—0 to 3 inches, very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry, moderate, medium and coarse, granular structure; slightly hard, friable, nonsticky, slightly plastic, many fine roots; slightly acid, gradual, wavy boundary. (2 to 4 inches thick)

A21—3 to 10 inches, grayish-brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry, common, medium, faint dark yellowish-brown (10YR 4/4) mottles, moderate, medium, subangular blocky structure, hard, firm, slightly acid, clear, smooth boundary (4 to 10 inches thick)

A22—10 to 17 inches, grayish-brown (2 5Y 5/2) loam, light gray (2.5Y 7/2) dry, common, medium, distinct dark-brown (10YR 4/3) mottles; moderate, medium, subangular blocky structure; slightly hard, firm, sticky, plastic; few fine roots; about 5 percent soft, iron-cemented nodules, thin, patchy clay films in some pores, slightly acid; abrupt, smooth boundary. (4 to 10 inches thick)

IIB2tg—17 to 33 inches, gray (5Y 5/1) clay, light gray (2 5Y 7/2) dry, common, medium, distinct yellowish-brown (10YR 5/6) mottles; strong, medium, prismatic structure, very hard, very firm, very sticky, very plastic, few fine roots, thin, continuous clay films in pores and on faces of peds, moderate organic staining on faces of peds; neutral; abrupt, smooth boundary. (14 to 24 inches thick)

IIIC1—33 to 40 inches, dark grayish-brown (2 5Y 4/2) loamy fine sand, light brownish gray (10YR 6/2) dry, common, fine, prominent yellowish-red (5YR 4/6) mottles, massive; soft, friable, nonsticky, nonplastic, few fine roots; neutral, abrupt, smooth boundary. (0 to 8 inches thick)

IVC2g—40 to 60 inches, gray (5Y 5/1) clay, light gray (5Y 7/2) dry, few, fine, distinct dark-brown (10YR 3/3) mottles; massive, very hard, very firm, very sticky, very plastic; neutral.

The IIB2tg horizon is silty, clay, or silty clay loam, but in places subhorizons of sandy loam or loamy fine sand are present. In places coarse-textured glacial drift is below a depth of 40 inches.

Included with this soil in mapping are small areas of moderately well drained and somewhat excessively drained soils.

This soil is somewhat poorly drained. Permeability is slow. Roots penetrate to a depth of more than 60 inches. This soil holds 8 to 10 inches of water available for plants. Runoff is slow, and the hazard of water erosion is slight. A seasonal water table is at a depth of 1 to 2 feet.

About 60 to 70 percent of the acreage of this soil has been cleared and is used mostly for pasture. Berries and vegetable crops are of minor importance. Capability unit IIIw-1; woodland group 4w2.

Casey fine sandy loam, 0 to 8 percent slopes (CdB).—The upper part of this soil is fine sandy loam.

Included with this soil in mapping, and making up as much as 20 percent of the mapped areas, are soils that have layers of stratified sandy loam and loamy sand and that are gravelly in various parts of the profile

Most areas of this soil are used for pasture, hay, and silage crops. About 25 percent of the areas are in native trees. Capability unit IIIw-1; woodland group 4w2.

Cassolary Series

The Cassolary series consists of well-drained soils on upland terraces Slopes range from 0 to 50 percent. Elevation ranges from 50 to 500 feet. These soils formed in reworked glacial and marine sediments. Native vegetation is mainly Douglas-

fir, western redcedar, western hemlock, red alder, bigleaf maple, rhododendron, salal, huckleberry, and swordfern. Annual precipitation ranges from 17 to 25 inches. The average annual air temperature is 50°F The above 32°F growing season ranges from about 160 to 260 days, and the above 28°F growing season ranges from about 220 to 320 days. Cassolary soils are associated mainly with Agnew, Alderwood, Clallam, Dick, Everett, Indianola, Kitsap, and Tukey soils.

In a representative profile in a wooded area, a thin layer of organic litter covers the surface. The upper 23 inches of the soil is sandy loam To a depth of 3 inches it is dark gray, between depths of 3 and 15 inches it is dark brown, and between depths of 15 and 23 inches it is dark grayish brown. Below this is grayish-brown silt loam that extends to a depth of 27 inches Beneath this, and extending to a depth of 38 inches, is grayish-brown silty clay loam. The next layer is light olive-brown fine sandy loam that extends to a depth of 49 inches It is underlain to a depth of 60 inches by very dark grayish-brown medium sand.

Most of the acreage of Cassolary soils is wooded. The soils are used mainly for production of trees and for small ranches and rural homesites

Cassolary sandy loam, 0 to 15 percent slopes (CfC).—This nearly level to rolling soil is on upland terraces. In most places slopes range from 5 to 10 percent.

Representative profile 350 feet east of west quarter corner of the NW¼SW¼SW¼ sec. 33, T. 30 N., R 1 W.

O1—3 inches to 1 inch, needles, leaves, bark, and fragments of wood.

O2—1 inch to 0, dark reddish-brown (5YR 2/2) partly decayed needles, leaves, bark, and fragments of wood, strongly acid, abrupt, wavy boundary (½ to 1½ inches thick)

A2—0 to 3 inches, dark-gray (10YR 4/1) sandy loam, light gray (10YR 7/1) dry, massive, soft, very friable, nonsticky, nonplastic, many fine, medium, and coarse roots, strongly acid; clear, wavy boundary. (2 to 4 inches thick)

B21ir—3 to 15 inches, dark-brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry, few, faint dark-brown (7.5YR 4/4) mottles, weak, fine and medium, subangular blocky structure, soft, very friable, nonsticky, nonplastic, many fine, medium, and coarse roots, 10 percent very hard, dark reddish-brown (5YR 3/4) iron concretions; medium acid, gradual, wavy boundary (10 to 18 inches thick)

B22—15 to 23 inches, dark grayish-brown (10YR 4/2) sandy loam, light brownish gray (10YR 6/2) dry; few, medium and coarse, distinct dark-brown (7 5YR 4/4) mottles, weak, medium and coarse, subangular blocky structure, soft, very friable, nonsticky, nonplastic, common fine, medium, and coarse roots, 8 percent very hard, dark reddish-brown (5YR 3/4) iron concretions, medium acid, abrupt, smooth boundary. (6 to 10 inches thick)

IIC1—23 to 27 inches, grayish-brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry, few, medium, faint dark yellowish-brown (10YR 4/4) mottles, massive, hard, firm, slightly sticky, plastic, few fine and medium roots; medium acid, clear, smooth boundary. (3 to 6 inches thick)

IIC2—27 to 38 inches, grayish-brown (2 5Y 5/2) silty clay loam, light gray (2 5Y 7/2) dry, common, medium, distinct dark yellowish-brown (10YR 4/4) mottles, massive, hard, firm, sticky, plastic, few fine and medium roots, slightly acid, clear, smooth boundary. (10 to 16 inches thick)

IIIC3—38 to 49 inches, light olive-brown (2 5Y 5/4) fine sandy loam, light yellowish brown (2 5Y 6/4) dry, few, medium and coarse, faint yellowish-brown (10YR 5/4) mottles, massive; soft, very friable, nonsticky, nonplastic, slightly acid, clear, wavy boundary (8 to 12 inches thick)

IVC4—49 to 60 inches, very dark grayish-brown (2 5Y 3/2) and grayish-brown (2 5Y 5/2) medium sand, dark grayish brown (2 5Y 4/2) and light brownish gray (2.5Y 6/2) dry, few, coarse, faint yellowish-brown (10YR 5/4) mottles, single grained; loose, nonsticky, nonplastic, few pebbles, neutral.

The depth to sand or loamy sand exceeds 40 inches. The A2 horizons range from fine sandy loam to sandy loam. The B21ir horizon is dark brown or brown fine sandy loam or sandy loam. The B22 horizon is dark grayish brown or brown fine sandy loam or sandy loam. The C horizons are interstratified silty clay loam, silt loam, fine sandy loam, sandy loam, loamy sand, and sand.

Included with this soil in mapping are small areas of Kitsap soils.

This soil is well drained. Permeability is moderately slow. Roots penetrate to a depth of more than 60 inches. This soil holds about 7 to 9 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This soil is used mainly for production of trees and for recreation areas and wildlife habitat. A small acreage is used for permanent pasture, hay, and home garden crops. Capability unit IIIe-1; woodland group 3d2.

Cassolary sandy loam, 15 to 30 percent slopes (CfD).—This hilly soil is on terraces along the breaks of ravines or marine bluffs.

Runoff is medium, and the hazard of water erosion is moderate. This soil is used mainly for production of trees and for recreation areas and wildlife habitat. Small acreages are used for rural homesites and for growing pasture, hay, and diversified garden crops. Capability unit IVe-3; woodland group 3d2.

Cassolary sandy loam, 30 to 50 percent slopes (CfE) —This steep soil is on canyon slopes and ocean bluffs. The dark-gray surface layer is absent in many places, and the silty clay loam layer in the underlying material is nearer the surface on the upper part of canyon slopes and ocean bluffs than it is on the lower ones.

Runoff is rapid, and the hazard of water erosion is severe. This soil is mainly used for production of trees and for recreation areas and wildlife habitat. Capability unit VIe-1; woodland group 3d2.

Cassolary-Everett complex, 0 to 15 percent slopes (ChC).—This mapping unit is about 60 percent Cassolary sandy loam, 0 to 15 percent slopes, and 40 percent Everett gravelly sandy loam, 0 to 15 percent slopes. The Cassolary soil is mostly gently sloping, and the Everett soil is rolling.

Included with these soils in mapping are small areas where slopes are as steep as 30 percent.

This complex is used mainly for production of trees and for recreation areas and wildlife habitat. Small acreages are used for rural homesites and for growing pasture, hay, and diversified home garden crops Capability unit IVe-1; woodland group 3f2.

Cassolary-Everett complex, 15 to 30 percent slopes (ChD) —This mapping unit is about 60 percent Cassolary sandy loam, 15 to 30 percent slopes, and 40 percent Everett gravelly sandy loam, 15 to 30 percent slopes. The Cassolary soil is moderately steep. The Everett soil is hilly and is mostly on glacial outwash terraces.

Included with these soils in mapping are small areas where slopes are less than 15 percent.

This complex is used mainly for production of trees and for recreation areas, rural homesites, and wildlife habitat. Capability unit VIe-1; woodland group 3f2.

Cassolary-Kitsap complex, 0 to 15 percent slopes (CkC).—This mapping unit is about 60 percent Cassolary sandy loam, 0 to 15 percent slopes, and 40 percent Kitsap silt loam, 0 to 15 percent slopes. The Cassolary soil is gently sloping to gently rolling, and the Kitsap soil is mostly in rolling terrain

Included with these soils in mapping are small areas where slopes are as steep as 30 percent.

This complex is used mainly for production of trees and for recreation areas and wildlife habitat. Small acreages are used for rural homesites and for pasture, hay, and diversified home garden crops. Capability unit IIIe-1; woodland group 3d2.

Cassolary-Kitsap complex, 15 to 30 percent slopes (CkD).—This mapping unit is about 60 percent Cassolary sandy loam, 15 to 30 percent slopes, and 40 percent Kitsap silt loam, 15 to 30 percent slopes. The Cassolary soil is mainly moderately steep. The Kitsap soil is moderately steep and is on hilly terrace benches along the upper margins of steep ravines and marine bluffs

Included with these soils in mapping are small areas where slopes are less than 15 percent and some where slopes are more than 30 percent.

This complex is used mainly for production of trees and for recreation areas, rural homesites, and wildlife habitat. Small acreages are used for pasture, hay, and diversified home garden crops. Capability unit IVe-3; woodland group 3d2.

Cassolary-Kitsap complex, 30 to 50 percent slopes (CkE).—This mapping unit is about 50 percent Cassolary sandy loam, 30 to 50 percent slopes, and 50 percent Kitsap silt loam, 30 to 50 percent slopes.

Included with these soils in mapping are small areas where slopes are less than 30 percent.

This complex is used mainly for production of trees and for recreation areas, rural homesites, and wildlife habitat. Capability unit VIe-1; woodland group 3d2.

Cathcart Series

The Cathcart series consists of well-drained soils underlain by sandstone bedrock at a depth of 24 to 40 inches. They are on glaciated uplands. Slopes range from 0 to 50 percent. Elevation ranges from about 50 to 800 feet. These soils formed in weathered sandstone and shale and some glacial till. Native vegetation consists mostly of Douglas-fir, western hemlock, western redcedar, red alder, maple, salal, salmonberry, huckleberry, bracken, and swordfern. Annual precipitation ranges from 25 to 45 inches. The average annual air temperature is about 50°F. The above 32°F growing season ranges from about 160 to 260 days, and the above 28°F growing season ranges from about 220 to 320 days. These soils are associated mainly with Alderwood, Cassolary, Indianola, Kitsap, Quilcene, Sinclair, and Whidbey soils.

In a representative profile the upper 9 inches of the soil is dark-brown gravelly silt loam. Below this, to a depth of 21 inches, is dark-brown or dark yellowish-brown gravelly heavy loam. The next layer, to a depth of 30 inches, is yellowish-brown, faintly mottled gravelly loam. Beneath this, and extending to a depth of 38 inches, is yellowish-brown, prominently mottled very gravelly heavy loam. It is underlain by yellowish-brown and light brownish-gray sandstone bedrock. The soil is medium acid throughout except in the upper 3 inches, where it is strongly acid.

Cathcart soils are used mainly for production of trees, for pasture, and for wildlife habitat, recreation areas, and rural homesites.

Cathcart gravelly silt loam, 0 to 15 percent slopes (CIC).—This nearly level to rolling soil is on glaciated uplands. Most slopes range from 5 to 10 percent.

Representative profile 1,240 feet north and 100 feet west of the east quarter corner sec. 17, T. 28 N., R. 1 W.:

Ap1—0 to 3 inches, dark-brown (7.5YR 3/2) gravelly silt loam, brown (7.5YR 5/2) dry, moderate, fine and medium, granular structure, soft, very friable, nonsticky, slightly plastic, many fine roots, 30 percent small and medium, rounded glacial pebbles and 5 percent fragmental sandstone pebbles, strongly acid, clear, smooth boundary. (2 to 8 inches thick)

Ap2—3 to 9 inches, dark-brown (7.5YR 3/2) gravelly silt loam, brown (7.5YR 5/2) dry, weak, fine, subangular blocky structure parting to moderate, medium and coarse granular structure, soft, very friable, nonsticky, slightly plastic, many fine roots, 30 percent small and medium, rounded glacial pebbles and 5 percent fragmental sandstone pebbles; medium acid; clear, wavy boundary. (0 to 6 inches thick)

B21ir—9 to 15 inches, dark-brown (7.5YR 4/4) gravelly heavy loam, light yellowish brown (10YR 6/4) dry, moderate, medium, subangular blocky structure, slightly hard, very friable, slightly sticky, slightly plastic, many fine roots, 15 percent rounded glacial pebbles and 15 percent fragmental sandstone pebbles, medium acid, clear, wavy boundary. (4 to 10 inches thick)

B22 —15 to 21 inches, dark yellowish-brown (10YR 4/4) gravelly heavy loam, light yellowish brown (10YR 6/4) dry, moderate, medium and coarse, subangular blocky structure, slightly hard, very friable, slightly sticky, slightly plastic, common fine roots, 15 percent rounded glacial pebbles and 15 percent fragmental sandstone pebbles, medium acid, clear, wavy boundary. (4 to 8 inches thick)

B3—21 to 30 inches, yellowish-brown (10YR 5/4) gravelly loam, very pale brown (10YR 7/4) dry, few, fine, faint yellowish-brown (10YR 5/8) mottles; weak, coarse, subangular blocky structure, slightly hard, friable, slightly sticky, slightly plastic; 35 percent fragmental sandstone pebbles and 10 percent rounded glacial pebbles, medium acid, clear, wavy boundary. (4 to 10 inches thick)

C—30 to 38 inches, yellowish-brown (10YR 5/4) very gravelly heavy loam, very pale brown (10YR 7/4) dry; common, fine and medium, prominent yellowish-red (5YR 5/8) mottles; massive, slightly hard, friable, slightly sticky, slightly plastic; few fine roots, 65 to 70 percent fragmental sandstone pebbles; medium acid, clear, wavy boundary. (0 to 8 inches thick)

R—38 to 60 inches, yellowish-brown (10YR 5/4) and light brownish gray (2.5Y 6/2) sandstone bedrock.

The depth to sandstone bedrock ranges from 24 to 40 inches. In wooded areas the A1 horizon is dark-brown gravelly loam as much as 4 inches thick, and in places the A2 horizon is less than 1 inch thick The Ap horizon is dark-brown or dark reddish-brown gravelly silt loam or gravelly loam. The B21ir horizon is dark-brown or dark reddish-brown gravelly loam or gravelly clay loam. The B22 horizon is dark-brown, dark yellowish-brown, or yellowish-brown gravelly loam or gravelly clay loam. The B3 and C1 horizons have the same color range as the B22 horizons but in places are very gravelly loam or very gravelly clay loam

Included with this soil in mapping are small areas of Kitsap soils. Also included are areas of soils more than 40 inches deep to sandstone bedrock.

This soil is well drained Permeability is moderate. Roots penetrate to the bedrock. This soil holds 3 to 6 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. About 25 percent of the acreage is under cultivation and is used for pasture and small home gardens. Capability unit IIIe-1; woodland group 4d2.

Cathcart gravelly silt loam, 15 to 30 percent slopes (CID).—This hilly soil is on glaciated uplands. Along the upper part of the slopes the soil is mostly 24 to 36 inches deep to bedrock. In places along the lower part of the slopes depth to bedrock is 40 to 48 inches.

Runoff is medium to rapid, and the hazard of water erosion is moderate to severe. This soil is used mainly for

production of trees and for wildlife habitat and recreation areas. Small areas, less than 10 percent of the total acreage, are under cultivation and are used for pasture and diversified home garden crops. Capability unit IVe-3; woodland group 4d2.

Cathcart gravelly silt loam, 30 to 50 percent slopes (CIE).—This steep soil is on glaciated uplands. Along the upper part of the slopes bedrock is at a depth of 24 to 30 inches, and along the lower part of the slopes it is at a depth of 30 to 40 inches.

Runoff is rapid, and the hazard of water erosion is severe. This soil is used mainly for production of trees and for recreation areas and wildlife habitat. Capability unit VIe-1; woodland group 4d2.

Clallam Series

The Clallam series consists of well-drained soils that have a very slowly permeable cemented layer at a depth of 20 to 40 inches. They are on uplands. Slopes range from 0 to 30 percent. Elevation ranges from 80 to 1,000 feet. These soils formed in glacial till under a forest of mixed coniferous and deciduous trees. Native vegetation is mainly Douglas-fir, cedar, madrone, and willow. Annual precipitation ranges from 18 to 25 inches. The average annual air temperature is 49°F. The above 32°F growing season ranges from 240 to 270 days, and the above 28°F growing season ranges from 300 to 330 days. These soils are associated mainly with Alderwood, Dick, Everett, Hoypus, Indianola, San Juan, Townsend, and Whidbey soils.

In a representative profile a thin layer of organic litter covers the surface. The upper 23 inches of the soil is gravelly sandy loam that is grayish brown in the upper 3 inches and dark grayish brown in the lower 20 inches. This is underlain by a cemented layer.

More than 60 percent of the acreage of Clallam soils has been cleared and is used for pasture, hay, silage, berries, orchards, small grains, and vegetable gardens. Wooded areas are used as a source of woodland products and for wildlife habitat and recreation areas.

Clallam gravelly sandy loam, 0 to 15 percent slopes (CmC).—This nearly level to rolling soil is on terraces. Most slopes range from 5 to 10 percent.

Representative profile 1,650 feet west and 660 feet north of southeast corner sec. 17, T. 30 N., R. 1 W.:

O1—2 inches to ¾ inch, leaves, needles, and twigs.
O2—¾ inch to 0, very dark grayish-brown (10YR 3/2), decomposed organic matter; strongly acid.
A2—0 to 3 inches, grayish-brown (10YR 5/2) gravelly sandy loam, light gray (2.5Y 7/2) and white (2.5Y 8/2) dry; weak, fine, granular structure, slightly hard, very friable, nonsticky, nonplastic; many roots, about 20 percent gravel; medium acid; abrupt, wavy boundary. (2 to 4 inches thick)
B21—3 to 14 inches, dark grayish-brown (2.5Y 4/2) gravelly sandy loam, light brownish gray (2.5Y 6/2) dry, weak, fine and medium, subangular blocky structure, slightly hard, very friable, nonsticky, nonplastic; many roots; few fine shot: about 35 percent gravel; medium acid; clear, wavy boundary. (8 to 19 inches thick)
B22—14 to 23 inches, dark grayish-brown (2 5Y 4/2) gravelly sandy loam, light brownish gray (2.5Y 6/2) dry; weak, medium and coarse, subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic, common roots, about 40 percent gravel (including a few cobbles), medium acid; gradual, wavy boundary. (7 to 18 inches thick)
C1sim—23 to 36 inches, olive-gray (5Y 4/2), weakly cemented gravelly sandy loam, light gray (5Y 7/2) dry, common, medium and coarse, dark yellowish-brown (10YR 4/4) and brown (7.5YR 4/4) mottles; massive, extremely hard, extremely firm; few fine roots penetrate upper few inches, medium acid; diffuse, smooth boundary (12 to 16 inches thick)
C2—36 inches, very compact gravelly sandy loam glacial till. (Many feet thick)

The A2 horizon ranges from gray to grayish brown. The B2 horizons range from grayish brown to dark grayish brown. The C1sim horizon is an olive-gray cemented layer that is 35 to 45 percent gravel and cobbles. Depth to the cemented layer ranges from 20 to 40 inches. The A2 and B2 horizons range from strongly acid to medium acid, and the C1sim horizon ranges from medium acid to slightly acid.

This soil is well drained. Permeability is moderate above the cemented layer. Roots penetrate to a depth of 20 to 40 inches. This soil holds about 2 to 4 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. The soil is saturated part of the time during the rainy season, and at times water moves laterally, in places, above the cemented layer.

Most of the acreage of this soil is used for growing pasture of mixed grass and alfalfa or grass and clover. Home garden crops, berries, and vegetables are also grown. Capability unit IVe-1; woodland group 4d2.

Clallam gravelly sandy loam, 15 to 30 percent slopes (CmD).—This hilly soil is on glacial terraces on the breaks of canyons and steep drainageways.

Runoff is medium, and the hazard of water erosion is moderate. This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 4d2.

Coastal Beaches

Coastal beaches (Co & CW) consist of sandy and gravelly sloping beaches in long, narrow strips. They are at the base of coastal bluffs or lowlands bordering the Pacific Ocean in western Jefferson County and along the Straits of Juan de Fuca, Admiralty Inlet, and Hood Canal in eastern Jefferson County.

Coastal beaches have no vegetation and are subject to continual wave action during high tides and storms.

This land type is used for clam and oyster production and for recreation areas and wildlife habitat. Capability unit VIIIw-1; not assigned to a woodland group.

Cut and Fill Land

Cut and fill land (Cu) consists of landfills in low, depressional, wet or swampy areas. It is made up of a mixture of many types of soil material. One of the largest areas of Cut and fill land is at the southwest end of Old Fort Flagler, between the marine bluffs and the beach, where a swampy area was filled for a gunnery range. Capability unit VIIIw-1; not assigned to a woodland group.

Dabob Series

The Dabob series consists of moderately well drained, very gravelly soils that have a very slowly permeable cemented layer at a depth of 20 to 36 inches. These soils are on glacial terraces. Slopes range from 0 to 30 percent. Elevation ranges from 100 to 800 feet. The Dabob soils formed under a coniferous-deciduous forest in very gravelly glacial till. Native vegetation is mainly Douglas-fir, western hemlock, willow, madrone, rhododendron, salal, and evergreen huckleberry. Annual precipitation ranges from 25 to 45 inches. The average annual air temperature is 49°F. The

above 32°F growing season ranges from about 180 to 220 days, and the above 28°F growing season ranges from about 240 to 280 days. These soils are associated mainly with Alderwood, Everett, Hoypus, Kitsap, Olete, and Sinclair soils.

In a representative profile in a wooded area, a thin layer of organic litter covers the surface. The upper 2½ inches of the soil is very dark gray very gravelly sandy loam. Below this, to a depth of 20 inches, is dark-brown very gravelly sandy loam that is distinctly mottled in the lower part. This is underlain by grayish-brown, distinctly mottled very gravelly sandy loam. At a depth of 29 inches is a dark-gray, distinctly mottled cemented layer. Glacial cobbles and stones are on the surface and throughout the soil.

These soils are used mainly for production of trees, and areas are almost entirely wooded. A few acres are used for rural homesites.

Dabob very gravelly sandy loam, 0 to 15 percent slopes (DaC).—This nearly level to rolling soil is on terraces. Most slopes range from 5 to 10 percent.

Representative profile 480 feet west and 320 feet south of the east quarter corner sec. 36, T. 28 N., R. 1 W.:

O1—3 inches to 2 inches, needles, leaves, bark, and fragments of wood.

O2—2 inches to 0, dark reddish-brown (5YR 2/2), partly decomposed needles, leaves, bark, and fragments of wood, dark reddish gray (5YR 4/2) dry, strongly acid, abrupt, wavy boundary. (1 to 3 inches thick)

A2—0 to 2½ inches, very dark gray (10YR 3/1) very gravelly sandy loam, gray (10YR 6/1) dry; weak, medium, granular structure; soft, very friable, nonsticky, nonplastic, many fine, medium, and coarse roots, 30 percent glacial gravel, medium acid, abrupt, wavy boundary. (1 to 3 inches thick)

B2ir—2½ to 13 inches, dark-brown (7.5YR 4/4) very gravelly sandy loam, light brown (7.5YR 6/4) dry, weak, fine, subangular blocky structure; soft, very friable, nonsticky, nonplastic, many fine, medium, and coarse roots; 55 percent glacial gravel and 5 percent cobbles, 8 percent hard, fine, iron-manganese concretions, medium acid, clear, wavy boundary. (8 to 12 inches thick)

B3—13 to 20 inches, dark-brown (10YR 4/3) very gravelly sandy loam, pale brown (10YR 6/3) dry; common medium and coarse, distinct, strong-brown (7.5YR 5/6) mottles and few fine, faint, yellowish-brown (10YR 5/6) mottles, weak, fine, subangular blocky structure, soft, very friable, nonsticky, nonplastic, common fine and medium roots, 65 percent glacial pebbles, slightly acid, gradual, wavy boundary. (5 to 8 inches thick)

C1—20 to 29 inches, grayish-brown (10YR 5/2) very gravelly sandy loam, light gray (10YR 7/2) dry; common medium and coarse, distinct, dark-brown (7.5YR 4/4) mottles, massive, hard, firm, nonsticky, nonplastic, few fine and medium roots, 60 percent glacial gravel, slightly acid; abrupt, wavy boundary. (4 to 14 inches thick)

C2sim—29 to 33 inches, dark-gray (10YR, 4/1), weakly cemented gravelly sandy loam, gray and light gray (10YR 6/1) dry; few fine, distinct, dark-brown and brown (7.5YR 4/4) mottles and common medium, distinct, yellowish-brown (10YR 5/6) mottles, massive; extremely hard, extremely firm, 45 percent fine glacial gravel, slightly acid, diffuse, smooth boundary. (3 to 10 inches thick)

C3—33 inches, very compact gravelly sandy loam glacial till. (Many feet thick)

Depth to the cemented layer ranges from 20 to 36 inches. The A2 horizon is gravelly sandy loam or very gravelly sandy loam. The B2ir horizon is dark-brown or brown very gravelly sandy loam and is 5 to 10 percent fine, iron-manganese concretions. The C1 horizon is grayish-brown to yellowish-brown very gravelly sandy loam. The C2sim horizon ranges from dark gray to yellowish brown and is 35 to 55 percent gravel. Reaction ranges from strongly acid to slightly acid, becoming less acid with depth. Content of coarse fragments in the soil is 50 to 70 percent.

This soil is moderately well drained. Permeability is moderately rapid above the cemented layer. Roots penetrate to a depth of 20 to 36 inches. This soil holds 1 to 3 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. A perched water table is on top of the cemented layer during the rainy season.

This soil is used almost entirely for production of trees and for wildlife habitat and recreation areas. It has limited use for rural homesites. Capability unit VIe-1; woodland group 5f2.

Dabob very gravelly sandy loam, 15 to 30 percent slopes (DaD).—This hilly soil is on glacial terraces adjacent to steep drainageways and canyons. Along the top half of the slopes the soil is mostly 20 to 24 inches deep over the cemented layer, and along the lower slopes it is 24 to 36 inches deep over this layer.

Runoff is medium to rapid, and the hazard of water erosion is moderate to severe. This soil is used mainly for production of trees and for wildlife habitat and recreation areas. It has limited use for rural homesites. Capability unit VIe-1; woodland group 5f2.

Dick Series

The Dick series consists of somewhat excessively drained, sandy soils. They formed in glacial outwash on plains and terraces. Slopes range from 0 to 15 percent. Elevation ranges from slightly above sea level to about 300 feet. Native vegetation consists mainly of Douglas-fir, western hemlock, rhododendron, salal, Oregon grape, huckleberry, and bracken. Annual precipitation ranges from 17 to 25 inches. The average annual air temperature is 50°F. The above 32°F growing season ranges from about 240 to 270 days, and the above 28°F growing season ranges from about 300 to 330 days. These soils are associated mainly with Agnew, Cassolary, Clallam, Everett, and Indianola soils.

In a representative profile in a wooded area, a 2- to 3-inch layer of organic litter covers the surface. The upper 4 inches of the soil is grayish-brown loamy sand. Below this, to a depth of 10 inches, is light brownish-gray loamy sand. Beneath this, and extending to a depth of 60 inches, is light olive-brown and olive-brown loamy sand. Below a depth of 37 inches this layer contains discontinuous, firm, dark yellowish-brown bands.

Most of the acreage of Dick soils is wooded. These soils are used mainly for production of trees and for permanent and summer rural homesites. Less than 20 percent of the acreage has been cleared and is used for crops.

Dick loamy sand, 0 to 15 percent slopes (DcC).—This nearly level to rolling soil is on moraine terraces and outwash plains. In most places slopes range from 4 to 10 percent.

Representative profile 0.2 mile west of Four Corners, 528 feet west and 100 feet south of the east quarter corner sec. 32, T. 30 N., R. 1 W.:

O1—2¼ inches to ¾ inch, needles, leaves, bark, fragments of wood, and moss.

O2—¾ inch to 0, partly decomposed needles, leaves, bark, fragments of wood, and moss.

A2—0 to 4 inches, grayish-brown (10YR 5/2) loamy sand, gray (10YR 6/1) dry, weak, very fine, granular structure, soft, very friable, nonsticky, nonplastic, common fine and medium roots; neutral, abrupt, smooth boundary. (3 to 5 inches thick)

B2—4 to 10 inches, light brownish-gray (2.5Y 6/2) loamy sand, light brownish gray (10YR 6/2) dry, common, fine, prominent brown (7.5YR 4/4) mottles; weak, very fine, subangular

blocky structure, soft, very friable, nonsticky, nonplastic, common fine and medium roots, neutral, clear, wavy boundary. (5 to 8 inches thick)

C1—10 to 24 inches, light olive-brown (2.5Y 5/4) loamy sand, light brownish gray (2 5Y 6/2) dry, few, fine, prominent brown (7.5YR 4/4) mottles, single grained, loose, nonsticky, nonplastic, few fine and medium roots, neutral, gradual, wavy boundary. (12 to 16 inches thick)

C2—24 to 37 inches, olive-brown (2.5Y 4/4) loamy sand, light brownish gray (2.5Y 6/2) dry, single grained, loose, nonsticky, nonplastic, few fine and medium roots; neutral, clear, wavy boundary (12 to 16 inches thick)

C3—37 to 60 inches, light olive-brown (2 5Y 5/4) loamy sand, very pale brown (10YR 7/3) dry, single grained, loose, nonsticky, nonplastic, few fine and medium roots; common coarse, distinct, dark yellowish-brown (10YR 4/4), discontinuous iron bands; neutral.

Reaction of the A and B horizons ranges from neutral to medium acid The A2 horizon is grayish-brown or light brownish-gray loamy sand or sandy loam. The B and C horizons are loamy sand or fine sand. Very thin, finer textured iron bands are between depths of 40 and 60 inches.

This soil is somewhat excessively drained. Permeability is rapid. Roots penetrate to a depth of more than 60 inches. This soil holds about 4 to 6 inches of water available for plants Runoff is slow, and the hazard of water erosion is slight.

This soil is used mainly for production of trees and for recreation areas and wildlife habitat. Small acreages under cultivation are used for growing permanent pasture, hay, berries, and vegetables. Capability unit VIs-1; woodland group 4s2.

Dimal Series

The Dimal series consists of somewhat excessively drained, very flaggy soils underlain by bedrock at a depth of 10 to 20 inches. These soils formed in some of the harder metamorphosed sandstones and shale bedrock materials of the western Olympic Mountain foothill areas. Dimal soils are on rough, broken mountain slopes and narrow, exposed ridge crests. Slopes range from 50 to 90 percent. Elevation ranges from about 1,000 to 3,400 feet. Native forest trees consist mostly of western hemlock, western redcedar, and Sitka spruce below elevations of 1,500 feet and Pacific silver fir, western hemlock, mountain hemlock, and alpine fir at the higher elevations. Annual precipitation ranges from 140 to 180 inches. The average annual air temperature is about 46°F. The above 32°F growing season ranges from 170 to 200 days, and the above 28°F growing season ranges from 180 to 220 days. These soils are associated with Itswoot, Snahopish, and Solleks soils.

In a representative profile in a wooded area, about 3 inches of litter and decomposing materials cover the surface. The upper 3 inches of the soil is dark-brown, very flaggy silty clay loam. Below this, to a depth of 16 inches, the soil is dark-brown, very flaggy silty clay loam that is about 75 percent coarse sandstone fragments. Bedrock is below a depth of 16 inches.

The Dimal soils are among the principal ones of the higher, steeper, mountainous areas in the western part of the county. They are used for production of trees, wildlife habitat, and recreation areas.

Dimal very flaggy silty clay loam, 50 to 90 percent slopes (DMF) –This steep to very steep soil is on rough, broken, mountainous slopes and narrow ridge crests In most places slopes range from 70 to 80 percent, but on ridge crests they are mostly 50 to 60 percent.

Representative profile 1 4 miles up the Maple Creek Road and above the road, NW¼SW¼SW¼ sec. 12, T. 26 N., R. 11 W.:

O1—2 inches to 1 inch, needles, bark, fragments of wood, and moss.

O2—1 inch to 0, dark reddish-brown (5YR 2/2), partly decomposed needles, bark, fragments of wood, and moss, very strongly acid, abrupt, smooth boundary. (1 to 2 inches thick)

A1—0 to 3 inches, dark-brown (10YR 3/3) very flaggy silty clay loam, brown (10YR 5/3) dry, moderate, fine and medium, granular structure, slightly hard, friable, slightly sticky, slightly plastic; many fine, medium and coarse roots; 45 percent sandstone fragments, strongly acid, gradual, wavy boundary. (1 to 5 inches thick)

B2—3 to 16 inches, dark-brown (7.5YR 4/4) very flaggy silty clay loam, light yellowish brown (10YR 6/4) dry; moderate, medium, angular blocky structure, slightly hard, friable, slightly sticky, slightly plastic, common fine, medium, and coarse roots; 75 percent sandstone fragments, medium acid, clear, wavy boundary (9 to 15 inches thick)

R—16 to 60 inches, dark-brown (7.5YR 4/4) shale and sandstone bedrock.

Depth to bedrock ranges from 10 to 20 inches. The A horizon is very dark grayish-brown or dark-brown flaggy or very flaggy silty clay loam. The B2 horizon is 50 to 80 percent coarse fragments. The soil material in this horizon is dark-brown, brown, and dark yellowish-brown very flaggy silty clay loam and clay loam. The A horizon ranges from very strongly acid to strongly acid, and the B horizon ranges from strongly acid to medium acid.

As much as 20 percent of some areas consists of inclusions of Solleks or Snahopish soils. Small areas of rock outcrop are also included.

This soil is somewhat excessively drained. Permeability is moderate. Roots penetrate to bedrock. This soil holds 1 to 2 inches of water available for plants. Runoff is very rapid, and the hazard of water erosion is very severe.

This soil is used for production of trees and for wildlife habitat and recreation areas. Capability unit VIIs-1; woodland group 4d1.

Everett Series

The Everett series consists of somewhat excessively drained, gravelly soils They formed in glacial outwash on terraces with steep escarpments. Slopes range from 0 to 50 percent. Elevation ranges from slightly above sea level to about 500 feet. Native vegetation consists mainly of Douglas-fir, western hemlock, western redcedar, rhododendron, madrone, salal, huckleberry, Oregon grape, and bracken. Annual precipitation ranges from 26 to 35 inches. The average annual air temperature is about 50°F. The above 32°F growing season ranges from about 200 days, and the above 28°F growing season ranges from about 280 to 300 days. These soils are associated mainly with Alderwood, Carlsborg, Cassolary, Hoypus, Indianola, Kitsap, and Sinclair soils.

In a representative profile 2 to 3 inches of forest litter and decomposing organic matter cover the surface. The upper 6 inches of the soil is dark-brown gravelly sandy loam. Below this, to a depth of 16 inches, is dark-brown gravelly sandy loam. Next, to a depth of 26 inches, is light olive-brown gravelly loamy sand. Beneath this, and extending to a depth of 48 inches, is dark grayish-brown very gravelly medium and coarse sand. Below this, to a depth of 60 inches, is grayish-brown fine and medium sand.

Everett soils are used mainly for production of trees.

Everett gravelly sandy loam, 0 to 15 percent slopes (EvC).—This nearly level to rolling soil is on glacial outwash terraces. In most places slopes range from 4 to 10 percent.

Representative profile in the South Point area, SW¼NW¼NW¼ sec. 16, T. 27 N., R. 1 E :

O1—2½ inches to 1 inch, needles, leaves, twigs, bark, moss, and fragments of wood.

O2—1 inch to 0, dark reddish-brown (5YR 2/2), decomposing organic litter, medium acid, abrupt, smooth boundary

A2—0 to 1 inch, dark-gray (10YR 4/1) gravelly fine sandy loam, light gray (10YR 6/1) dry, weak, fine and medium, granular structure, soft, very friable, nonsticky, nonplastic, many fine roots; 35 percent rounded, fine and medium pebbles, medium acid, clear, wavy boundary (½ to 1 inch thick)

B21ir—1 to 6 inches, dark-brown (10YR 3/3) gravelly sandy loam, brown (10YR 5/3) dry, weak, fine, granular and weak, fine, subangular blocky structure, soft, very friable, nonsticky, nonplastic, many fine, medium, and coarse roots; 40 percent rounded, fine and medium pebbles and few fine, shot-like pebbles coated with iron oxide, medium acid, gradual, wavy boundary. (4 to 7 inches thick)

B22ir —6 to 16 inches, dark-brown (10YR 4/3) gravelly sandy loam, pale brown (10YR 6/3) dry, massive, soft, very friable, nonsticky, nonplastic, common fine and medium roots, 45 percent rounded, fine and medium pebbles, medium acid, gradual, wavy boundary. (9 to 14 inches thick)

IIB3—16 to 26 inches, light olive-brown (2 5Y 5/4) gravelly loamy sand, light yellowish brown (2 5Y 6/4) dry; single grained, loose, nonsticky, nonplastic, few fine roots, 30 percent rounded, fine and medium pebbles, slightly acid, clear, wavy boundary. (10 to 15 inches thick)

IIIC1—26 to 48 inches, dark grayish-brown (2 5Y 4/2) very gravelly medium and coarse sand that has a salt-and-pepper appearance, light brownish gray (2 5Y 6/2) dry, single grained, loose, nonsticky, nonplastic, very few fine roots, 65 percent rounded, fine and medium pebbles, slightly acid; clear, wavy boundary. (20 to 25 inches thick)

IIIC2—48 to 60 inches, grayish-brown (2 5Y 5/2) fine and medium sand, light gray (2 5Y 7/2) dry, medium sand that is structureless (single grained) and, in lower part, a layer of fine sand that is structureless (massive) and 3 to 4 inches thick, loose, nonsticky, nonplastic, 10 percent fine and medium gravel, slightly acid.

In disturbed areas the A2 horizon is absent The B22ir horizon ranges from dark yellowish brown to dark brown The C horizons are coarsely stratified with very gravelly medium and coarse sand and fine and medium sand. They are 5 to 65 percent gravel. Color ranges from yellowish brown to dark grayish brown. Below a depth of 50 inches a few compacted layers of gravelly sandy loam or loamy sand have reddish-brown, iron-manganese coatings on surfaces of pebbles

This soil is somewhat excessively drained Permeability is rapid. Roots penetrate to a depth of more than 60 inches. This soil holds about 3 to 4 inches of water available for

Figure 2.—**Pasture on Everett gravelly sandy loam, 0 to 15 percent slopes.**

plants. Runoff is slow, and the hazard of water erosion is slight to moderate.

This soil is used mainly for production of trees, wildlife habitat, and recreation areas. Approximately 20 percent of the acreage of this soil has been cleared and is used for growing permanent (fig. 2) pasture, hay, and diversified garden crops. Capability unit VIe-1; woodland group 3f2.

Everett gravelly sandy loam, 15 to 30 percent slopes (EvD).—This hilly soil is on glacial outwash moraine terraces where they converge with the steep ravines and drainageways.

Runoff is slow to medium, and the hazard of water erosion is slight to moderate. This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3f2.

Everett gravelly sandy loam, 30 to 50 percent slopes (EvE).—This steep soil is on the sides of ravines and waterways below the hilly glacial terraces.

Runoff is medium, and the hazard of water erosion is moderate. This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3f2.

Grove Series

The Grove series consists of somewhat excessively drained and well-drained[2] very gravelly soils. These soils formed in glacial outwash on terraces and plains. Slopes range from 0 to 50 percent. Elevation ranges from slightly above sea level to about 500 feet. Native vegetation consists mostly of Douglas-fir, western hemlock, white pine, some western redcedar, and an understory mostly of salal, bracken, evergreen huckleberry, and rhododendron. Annual precipitation ranges from 60 to 120 inches. The average annual air temperature is about 50°F. The above 32°F growing season ranges from about 160 to 200 days, and the above 28°F growing season ranges from about 210 to 250 days. These soils are associated mainly with Ahl, Hoodsport, Lystair, and Olete soils.

In a representative profile (fig. 3) about 2½ inches of needles, twigs, leaves, and partly decomposed organic matter cover the surface The upper 12 inches of the soil is dark reddish-brown very gravelly loamy sand. Below this, to a depth of 27 inches, is reddish-brown very gravelly coarse sand. Beneath this, and extending to a depth of 40 inches, is dark-brown very gravelly sand. Below this, to a depth of 60 inches, is very dark grayish-brown gravelly coarse sand. Glacial cobbles are on the surface and throughout the profile in places.

Most of the Grove soils are wooded. Besides their use for production of trees, another important use is for summer homesites.

Grove very gravelly loamy sand, 0 to 15 percent slopes (GoC) —This soil is on glacial terraces and outwash plains. In most places slopes range from 4 to 10 percent.

Representative profile 0.5 mile west of Jackson Cove and 0.1 mile west of powerline in SE¼NE¼NW¼ sec. 13, T. 26 N., R. 2 W.:

O1—2½ inches to 1 inch, needles, twigs, and leaves.
O2—1 inch to 0, black (5YR 2/1), partly decomposed organic matter from needles, twigs, and leaves; strongly acid; abrupt, smooth boundary.

B21ir—0 to 12 inches, dark reddish-brown (5YR 3/4) very gravelly loamy sand, reddish brown (5YR 5/3) dry, weak, very fine, granular structure; soft, very friable, nonsticky, nonplastic, many fine and medium roots, 55 percent mixed gravel; medium acid, gradual, wavy boundary. (6 to 12 inches thick)
B22ir—12 to 27 inches, reddish-brown (5YR 4/4) very gravelly coarse sand, reddish brown (5YR 5/4) dry, single grained; loose, nonsticky, nonplastic; many fine and medium roots, 55 percent mixed gravel; medium acid; clear, wavy boundary. (12 to 16 inches thick)

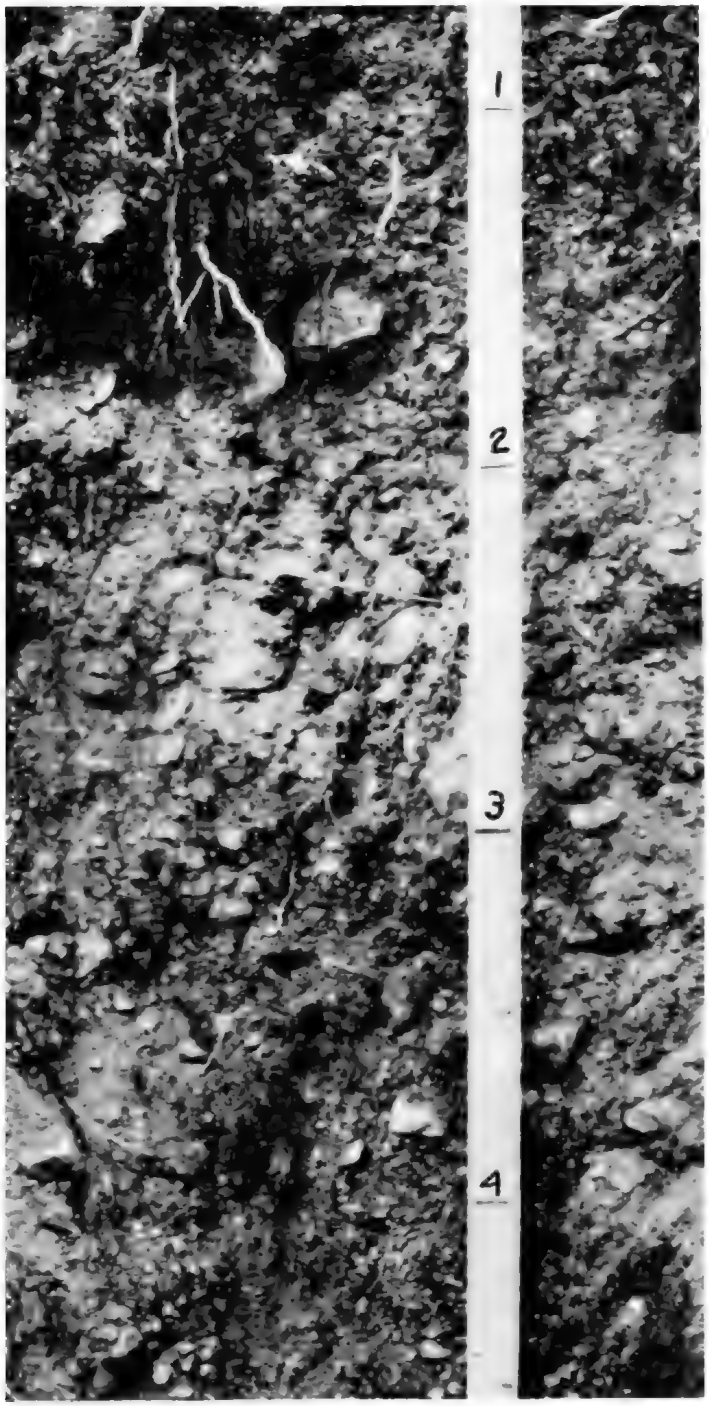

Figure 3.—**Profile of Grove very gravelly loamy sand, 0 to 15 percent slopes. Numbers on tape refer to depth in feet.**

[2] The Grove very gravelly sandy loam mapping units are outside of the range of the series in that they have a weakly consolidated substratum at a depth of 30 to 40 inches. This difference does not alter their usefulness, and it affects their behavior only to a minor extent

B3—27 to 40 inches, dark-brown (7.5YR 4/4) very gravelly sand, brown (7.5YR 5/4) dry, single grained, loose, nonsticky, nonplastic; common fine and medium roots, 60 percent mixed gravel, medium acid, clear, irregular boundary. (10 to 15 inches thick)

C—40 to 60 inches, very dark grayish-brown (10YR 3/2) gravelly coarse sand, dark gray (10YR 4/1) dry, single grained, loose, nonsticky, nonplastic, few fine roots, 50 percent mixed gravel, slightly acid.

The B21ir horizon ranges from dark reddish brown to dark reddish gray in color and from very gravelly loamy sand to very gravelly sandy loam in texture. The B22ir horizon ranges from dark reddish brown to reddish brown in color and from very gravelly coarse sand to very gravelly loamy sand in texture. The B3 horizon is dark-brown to yellowish-brown very gravelly loamy sand to very gravelly coarse sand. The C horizon, between depths of 3 and 6 feet or more, is loose, very dark grayish-brown to olive-gray gravelly coarse sand and very gravelly coarse sand.

Included with this soil in mapping are small areas where the soil has a consolidated substratum and other areas where the soil is well drained.

This soil is somewhat excessively drained. Permeability is very rapid. Roots penetrate to a depth of 60 inches or more. This soil holds about 2 to 4 inches of water available for plants. Runoff is slow, and the hazard of water erosion is slight.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIs-1; woodland group 4f2.

Grove very gravelly loamy sand, 15 to 30 percent slopes (GoD) This moderately steep soil is on hilly glacial outwash terraces along the breaks of steep canyons or waterways of the foothills. The surface layer and subsoil are 15 to 20 inches deep over a substratum of gravelly and very gravelly sand

Included with this soil in mapping are small areas of gravelly loam soils and soils that have a consolidated substratum.

Runoff is slow to medium, and the hazard of water erosion is slight to moderate. This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIs-1; woodland group 4f2.

Grove very gravelly loamy sand, 30 to 50 percent slopes (GoE) This steep soil is on the sides of canyons and waterways closely associated with glacial outwash plains and rolling to hilly terraces. Along the upper half of slopes the surface layer and subsoil are 12 to 16 inches deep over the substratum of gravelly sand and very gravelly sand. Along the lower part of the slopes they are 16 to 24 inches deep over this type of substratum.

Runoff is medium, and the hazard of water erosion is moderate. This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIs-1; woodland group 4f2.

Grove very gravelly sandy loam, 0 to 15 percent slopes (GrC)—This nearly level to strongly sloping soil has a surface layer of very gravelly sandy loam and a subsoil of gravelly sand that rests abruptly on a substratum of weakly cemented, sandy glacial till at a depth of 30 to 40 inches.

This soil is well drained. Permeability is moderately rapid above the cemented substratum. Permeability of the substratum is slow or very slow. Roots penetrate to the cemented substratum. This soil holds 2 to 4 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate During the rainy season the soil is saturated above the cemented substratum in places.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d2.

Grove very gravelly sandy loam, 15 to 30 percent slopes (GrD).—This moderately steep soil has a surface layer of very gravelly sandy loam and a substratum of weakly cemented sandy glacial till at a depth of 30 to 40 inches.

This soil is well drained. Permeability above the cemented substratum is moderately rapid. Permeability of the cemented substratum is slow or very slow. Roots penetrate to the cemented substratum. This soil holds 2 to 4 inches of water available for plants. Runoff is medium, and the hazard of erosion is moderate In places the soil is saturated above the cemented substratum during the rainy season.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas Capability unit VIe-1; woodland group 3d2.

Hoh Series

The Hoh series consists of well-drained soils that formed in alluvium containing, in most places, a high percentage of glacial silt They are mostly along the broad river flood plains where they are subject to overflow once every 5 to 15 years. In most places the Hoh silt loam is higher above the present river channels than Hoh fine sandy loam and is subject to less frequent overflow. Slopes range from 0 to 2 percent. Elevation ranges from 10 to 400 feet. Native vegetation consists mostly of Sitka spruce, western hemlock, red alder, western redcedar, vine maple, bigleaf maple, cottonwood, annual and perennial grasses, salmonberry, huckleberry, swordfern, and deerfern. Annual precipitation ranges from 100 to 165 inches. The average annual air temperature is about 49°F The above 32°F growing season ranges from 170 to 195 days, and the above 28°F growing season ranges from 190 to 210 days. Hoh soils are associated with Huel, Kalaloch, and Queets soils.

In a representative profile in a wooded area, a 2-inch layer of organic litter covers the surface. The upper 5 inches of the soil is dark reddish-brown silt loam Below this, to a depth of 13 inches, is dark grayish-brown silt loam. Beneath this, and extending to a depth of 21 inches, is dark grayish-brown very fine sandy loam. Next, extending to a depth of 36 inches, is very dark grayish-brown fine sandy loam. Below this, to a depth of 42 inches, is very gravelly sandy loam. The next layer is very dark gray very gravelly coarse sand that extends to a depth of 60 inches. Reaction is very strongly acid in the upper part of the profile and strongly acid below.

Hoh soils are more productive than most soils in the survey area. They are used mainly for production of trees, for recreation areas and wildlife habitat, and for rural homesites.

Hoh silt loam (HH).—This nearly level soil is on low river terraces which are dissected in places by old channels that have become stabilized for periods generally of more than 30 years. In most places slopes are 1 to 2 percent.

Representative profile 2.7 miles southwest of junction of U.S. Highway 101 and Lower Hoh River Road and 0.8 mile south to end of logging road in NW¼NW¼NW¼ sec. 8, T. 26 N., R. 12 W., 150 feet from river bank:

O2—2 inches to 0, decomposed leaves, needles, and fragments of wood.

A1—0 to 5 inches, dark reddish-brown (5YR 2/2) silt loam, dark reddish gray (5YR 4/2) dry, moderate, fine, granular structure; slightly hard, friable, nonsticky, nonplastic, common

fine and medium roots, few fine, soft iron concretions, very strongly acid, clear, smooth boundary. (3 to 6 inches thick)

A3—5 to 13 inches, dark grayish-brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry, weak, fine and medium, subangular blocky structure, slightly hard, friable, nonsticky, nonplastic, common fine and medium roots, strongly acid, gradual, smooth boundary (4 to 8 inches thick)

C1—13 to 21 inches, dark grayish-brown (10YR 4/2) very fine sandy loam, light brownish gray (10YR 6/2) dry, massive, soft, friable, nonsticky, nonplastic, common fine roots, strongly acid, gradual, smooth boundary (5 to 10 inches thick)

C2—21 to 36 inches, very dark grayish-brown (2.5Y 3/2) fine sandy loam, grayish brown (2.5Y 5/2) dry, massive, soft, friable, nonsticky, nonplastic, few fine roots, strongly acid, clear, smooth boundary (12 to 20 inches thick)

IIC3—36 to 42 inches, very dark grayish-brown (2.5Y 3/2) very gravelly sandy loam, grayish brown (2.5Y 5/2) dry, massive, soft, very friable, nonsticky, nonplastic, few fine roots, 60 percent gravel, strongly acid, clear, smooth boundary (4 to 10 inches thick)

IIIC4—42 to 60 inches, very dark gray (5Y 3/1) very gravelly coarse sand, gray (5Y 5/1) dry; single grained, loose, 70 percent gravel and cobbles, strongly acid.

The A1 horizon is very dark grayish brown, very dark brown, dark brown, or dark reddish brown. The A3 horizon is dark grayish-brown or dark-gray, stratified silt loam, very fine sandy loam, or fine sandy loam. The C horizon is very dark gray, dark gray, dark grayish brown, and very dark grayish brown. It is stratified very fine sandy loam, fine sandy loam, sandy loam, loamy fine sand, fine sand, or coarse sand, and it is 50 to 75 percent gravel and cobbles in the lower part. The C horizon is strongly acid or medium acid.

This soil is well drained. Permeability is moderate to a depth of about 36 inches and moderately rapid below that depth. Roots penetrate to a depth of more than 60 inches. This soil holds 7 to 9 inches of water available for plants. Runoff is slow to very slow, and the hazard of water erosion is slight. The hazards of river overflow and streambank erosion are moderate to severe.

Included with this soil in mapping are areas where the seasonal high water table is at a depth of 4 to 5 feet.

This soil is used mainly for production of trees (fig. 4), rural homesites, recreation areas, and wildlife habitat. About

Figure 4.—**Red alder and western hemlock on Hoh silt loam.**

Figure 5.—**Pasture on Hoh silt loam.**

25 percent of the acreage of this soil is under cultivation. Ranchers in the major river valleys raise cattle, which graze on permanent pastures (fig. 5) and on many of the natural grass-covered forest glades. Permanent residents grow home gardens that include fruit trees, berries, and diversified vegetable crops. Capability unit IVw-2; woodland group 2o1.

Hoh fine sandy loam (HF) —The upper 3 inches of this nearly level soil is very dark grayish-brown fine sandy loam. Below this, to a depth of 8 inches, is dark grayish-brown fine sandy loam that has weak, granular and platy structure Beneath this, and extending to a depth of 15 inches, is fine sandy loam. This is underlain by stratified layers of thick, very dark gray fine sandy loam and sandy loam that has platy structure or is massive. The soil is very gravelly below a depth of 36 inches.

Included with this soil in mapping are areas where the soil contains layers of sand or loamy sand.

This soil is generally closer to the present river channel than Hoh silt loam and subject to more frequent overflow and streambank erosion. It holds 5 to 7 inches of water available for plants. Runoff is slow, and the hazard of erosion is slight.

This soil is used mainly for production of trees, rural homesites, recreation areas, and wildlife habitat. From 10 to 15 percent of the acreage is currently under cultivation and is used for permanent pasture and small home gardens. Cattle graze a large part of the tree-covered acreage. Capability unit IVw-2; woodland group 3o1.

Hoko Series

The Hoko series consists of moderately well drained, gravelly soils that have a very slowly permeable cemented layer at a depth of 20 to 40 inches Slopes range from 0 to 50 percent. Elevation ranges from about 50 to 1,500 feet. These soils formed in glacial till under western hemlock, western redcedar, Sitka spruce, Pacific silver fir, vine maple, salmonberry, devilsclub, huckleberry, swordfern, and deerfern. Annual precipitation ranges from 100 to 170 inches. The average annual air temperature is 47°F to 50°F. The above 32°F growing season ranges from 150 to 180 days, and the above 28°F growing season ranges from 190 to 220 days. These soils are associated mainly with Klone, Calawah, Itswoot, Kalaloch, Phelan, Snahopish, and Tealwhit soils

In a representative profile in a wooded area, about 5 inches of needles, leaves, bark, and humus cover the surface. The upper 16 inches of the soil is gravelly silt loam. From the surface to a depth of 4 inches this material is dark reddish brown. Below that, to a depth of 8 inches, it is dark reddish gray, and between depths of 8 and 12 inches it is dark brown Below that, to a depth of 16 inches, it is strong brown. Beneath this, and extending to a depth of 29 inches, is strong-brown and pale-brown gravelly silty clay loam. Below this is a cemented layer

The Hoko soils are used for growing forest products and as wildlife habitat and recreation areas.

Hoko gravelly silt loam, 0 to 15 percent slopes (HKC).—This gently sloping to strongly sloping soil is on glacial terraces.

Representative profile 0.5 mile east of the Clearwater River Road along the Boulder Creek logging road, 15 feet north of the road in SE¼NE¼NW¼ sec. 29, T. 24 N., R. 12 W.:

O1—5 inches to 2 inches, needles, leaves, twigs, bark, and moss.
O2—2 inches to 0, dark reddish-brown (5YR 2/2) decomposing organic matter, very strongly acid.

A11—0 to 4 inches, dark reddish-brown (5YR 3/2) gravelly silt loam, reddish gray (5YR 5/2) dry; moderate, medium and coarse, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; 30 percent rounded pebbles, including some cobbles; strongly acid, clear, wavy boundary. (3 to 5 inches thick)

A12—4 to 8 inches, dark reddish-gray (5YR 4/2) gravelly silt loam, light reddish brown (5YR 6/3) dry, moderate, fine and medium, subangular blocky structure, hard, friable, sticky, plastic, many fine, medium, and coarse roots, 35 percent rounded pebbles, including some cobbles; strongly acid; clear, wavy boundary. (3 to 5 inches thick)

B21—8 to 12 inches, dark-brown (7 5YR 4/4) gravelly silt loam, pink (7.5YR 7/4) dry; common, fine and medium, distinct yellowish-red (5YR 5/6) mottles, moderate, medium and coarse, subangular blocky structure, hard, friable, sticky, plastic, slightly smeary feel, many fine, medium, and coarse roots, 35 percent rounded pebbles, including some cobbles, strongly acid, gradual, wavy boundary (3 to 6 inches thick)

B22—12 to 16 inches, strong-brown (7.5YR 5/6) gravelly silt loam, reddish yellow (7.5YR 7/6) dry; many, medium and coarse, faint dark-brown (7.5YR 4/4) mottles, weak, medium and coarse, subangular blocky structure, hard, friable, sticky, plastic, slightly smeary feel, common fine and medium roots; 35 percent rounded pebbles, including some cobbles; medium acid, gradual, wavy boundary. (3 to 7 inches thick)

B23—16 to 22 inches, strong-brown (7.5YR 5/8) gravelly silty clay loam, reddish yellow (7.5YR 8/6) dry, few, fine, faint dark-brown (7.5YR 4/4) mottles; weak, medium and coarse, prismatic and weak, very fine and fine, subangular blocky structure, hard, friable, sticky, plastic, smeary feel; common fine and medium roots; 30 percent rounded pebbles and about 10 percent small and medium cobbles; medium acid, clear, smooth boundary. (5 to 7 inches thick)

C1—22 to 29 inches, pale-brown (10YR 6/3) gravelly silty clay loam, white (10YR 8/2) dry, massive; very hard, firm, sticky, plastic; few fine roots, 30 percent rounded pebbles; medium acid, gradual, wavy boundary. (5 to 8 inches thick)

C2sim—29 to 40 inches, pale-brown (10YR 6/3), weakly cemented gravelly silty clay loam, white (10YR 8/2) dry, massive, extremely hard, extremely firm; few fine roots in upper few inches, 30 percent rounded pebbles, medium acid, diffuse, smooth boundary (9 to 14 inches thick)

C3—40 inches, very compact gravelly silty clay loam glacial till (Many feet thick)

The A horizons are dark reddish-brown or dark reddish-gray to dark-brown gravelly loam or gravelly silt loam. The B horizons are strong-brown, dark-brown, brown, and dark yellowish-brown gravelly silt loam, gravelly loam, gravelly silty clay loam, or gravelly clay loam The A and B horizons are 25 to 35 percent gravel and cobbles throughout. The C1 horizon is light brownish gray to pale brown. The C2sim horizon is pale brown to olive gray. Reaction ranges from very strongly acid to medium acid throughout the profile.

Included with this soil in mapping are small areas of somewhat excessively drained soils.

This soil is moderately well drained. Permeability is moderate above the cemented layer. Roots penetrate to the cemented layer. This soil holds about 3 to 6 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. A perched water table is on top of the cemented layer during the rainy season.

This soil is used mainly for production of trees and for wildlife habitat, recreation areas, and rural homesites. Capability unit VIe-1; woodland group 3d1.

Hoko gravelly silt loam, 15 to 30 percent slopes (HKD).—This soil is generally along the mountain foothill toe slopes in close association with Klone soils. On the upper part of the slopes the soil is 20 to 30 inches deep to the cemented layer. On the lower part of the slopes it is 30 to 40 inches deep to this layer.

Runoff is medium to rapid, and the hazard of water erosion is moderate to severe. This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d1.

Hoko gravelly silt loam, 30 to 50 percent slopes (HKE).—This soil is on the higher mountain foothills and along the stream and river valley sidewalls. The steeper areas of these soils are generally 20 to 24 inches deep to the cemented layer. The less steep areas are 24 to 36 inches deep to this layer.

Included with this soil in mapping are areas where the surface layer is flaggy silty clay loam.

Runoff is rapid, and the hazard of water erosion is severe. This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d1.

Hoko-Snahopish association, hilly (HLE).—This association consists of about 65 percent Hoko gravelly silt loam, 15 to 30 percent slopes, and about 35 percent Snahopish silty clay loam, 0 to 30 percent slopes. The Hoko soil is mostly hilly, and the Snahopish soil is mostly nearly level to gently rolling.

The soils of this association are used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d1.

Hoko-Tealwhit association, gently rolling (HMC).—This association consists of about 70 percent Hoko gravelly silt loam, 0 to 15 percent slopes, and about 30 percent Tealwhit silty clay loam, 0 to 8 percent slopes. The Hoko soil is mostly gently rolling, and the Tealwhit soil is mostly nearly level.

This association is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d1.

Hoko Gravelly Silt Loam, Wet Variant

Hoko gravelly silt loam, wet variant, 0 to 8 percent slopes (HNB) is a nearly level to gently sloping soil of the glacial terraces. The upper 5 to 7 inches of the soil is gravelly silt loam containing numerous dark reddish-brown iron-manganese concretions. Beneath this is a layer 2 to 4 inches thick that has brown and very dark grayish-brown mottles. This layer is underlain by light grayish-brown cobbly clay loam that has dark reddish-brown mottles and a few concretions. The cemented layer, at a depth of 8 to 24 inches, is mottled and is 40 to 60 percent gravel and cobbles. All horizons are very strongly acid.

This soil is poorly drained. It holds about 2 to 4 inches of water available for plants. Runoff is slow, and the hazard of water erosion is slight.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIw-1; woodland group 3w1.

Hoodsport Series

The Hoodsport series consists of moderately well drained soils that have a very slowly permeable cemented layer at a depth of 20 to 36 inches They are on terraces adjacent to the steep, rough, broken mountain foothills. Slopes range from 0 to 30 percent. Elevation ranges from slightly above sea level to 500 feet. These soils formed in glacial till under western redcedar, western hemlock, red alder, wild cherry, madrone, rhododendron, and salal Annual precipitation ranges from 55 to 65 inches. The average annual air tempera-

ture is about 50°F. The above 32°F growing season ranges from about 150 to 200 days, and the above 28°F growing season ranges from about 200 to 240 days. These soils are associated mainly with Ahl, Grove, Lystair, Olete, and Triton soils.

In a representative profile about 3 inches of needles, leaves, bark, and humus cover the surface. The upper 17 inches of the soil is reddish-brown very gravelly sandy loam. Below this, to a depth of 28 inches, is dark yellowish-brown gravelly sandy loam. Beneath this is a very dark gray cemented layer. Glacial cobbles and stones are present on the surface and throughout the soil.

Nearly all of the Hoodsport soils are wooded. Besides production of trees, another important use is for rural woodland homesites.

Hoodsport very gravelly sandy loam, 0 to 15 percent slopes (HoC).—This nearly level to rolling soil is on glacial terraces. In most places slopes range from 6 to 12 percent

Representative profile 60 feet west of U.S. Highway 101 and 120 yards south and 120 yards west of SE¼SW¼ corner sec. 29, T. 25 N., R. 2 W.:

O1—2½ inches to 1 inch, needles, leaves, wood, and bark.
O2—1 inch to 0, black (5YR 2/1) partly decomposed needles, leaves, wood, and bark; strongly acid; abrupt, smooth boundary. (½ to 2 inches thick)
B21ir—0 to 6 inches, reddish-brown (5YR 4/4) very gravelly sandy loam, reddish brown (5YR 5/4) dry, weak, medium and coarse, granular structure, soft, very friable, nonsticky, nonplastic, many roots; 60 percent gravel, strongly acid, gradual, wavy boundary. (4 to 8 inches thick)
B22ir—6 to 17 inches, reddish-brown (5YR 4/4) very gravelly sandy loam, reddish brown (5YR 5/4) dry, weak, fine and medium, subangular blocky structure, soft, very friable, nonsticky, nonplastic, many roots, 60 percent gravel, strongly acid; gradual, wavy boundary. (10 to 16 inches thick)
C1—17 to 28 inches, dark yellowish-brown (10YR 4/4) very gravelly sandy loam, yellowish brown (10YR 5/6) dry, massive, soft, very friable, nonsticky, nonplastic, many roots, 70 percent gravel; strongly acid, abrupt, smooth boundary (6 to 12 inches thick)
C2sim—28 to 45 inches, dark-gray (5Y 4/1) very gravelly sandy loam, gray (5Y 5/1) dry, massive, extremely hard, extremely firm, strongly cemented, 55 percent gravel; strongly acid, diffuse, smooth boundary. (14 to 20 inches thick)
C3 45 inches, very compact, weakly cemented glacial till. (Many feet thick)

The B horizons are dark reddish brown to reddish brown The B and C horizons are 50 to 70 percent gravel and cobbles. The C2sim horizon is gray, dark gray, or olive gray and many feet thick. This soil is medium acid or strongly acid throughout the profile

The soil is moderately well drained. Permeability is moderately rapid above the cemented layer. Roots penetrate to a depth of 20 to 36 inches. This soil holds 2 to 4 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate A perched water table is on top of the cemented layer during the rainy season.

This soil is used mainly for producing trees and for wildlife habitat and recreation areas Capability unit VIe-1; woodland group 3d2.

Hoodsport very gravelly sandy loam, 15 to 30 percent slopes (HoD).—This hilly soil is on glacial terraces. In the higher areas the soil is generally 20 to 24 inches deep to the cemented layer, and in the lower areas it is 24 to 36 inches deep to this layer.

Included with this soil in mapping are small areas having large basalt boulders and basalt bedrock outcrops

Runoff is medium, and the hazard of water erosion is moderate. This soil is used mainly for producing trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d2

Hoodsport gravelly loam, 0 to 15 percent slopes (HpC).—This nearly level to rolling soil is in small, isolated areas on glacial terrace ridgetops Elevation ranges from 300 to 500 feet. The upper 12 inches or more is dark reddish-brown gravelly loam. Reaction is slightly acid to medium acid. Permeability is moderate above the cemented layer. This soil holds about 3 to 5 inches of water available for plants.

This soil is used mainly for production of trees for wildlife habitat and recreation areas Capability unit IVe-1; woodland group 3d2.

Hoodsport-Grove very gravelly sandy loams, 0 to 30 percent slopes (HrD) —This mapping unit consists of about equal proportions of Hoodsport very gravelly sandy loam, 0 to 15 percent slopes, and Grove very gravelly loamy sand, 15 to 30 percent slopes. The Hoodsport soil is mostly undulating to gently rolling, and the Grove soil is mostly hilly.

This complex is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d2.

Hoypus Series

The Hoypus series consists of somewhat excessively drained, gravelly soils. These soils formed in glacial outwash on terraces Slopes range from 0 to 50 percent. Elevation ranges from 100 to 500 feet. Native vegetation consists mainly of Douglas-fir, western hemlock, western redcedar, madrone, rhododendron, salal, Oregon grape, huckleberry, and bracken. Annual precipitation ranges from 18 to 30 inches. The average annual air temperature is about 50°F. The above 32°F growing season ranges from 200 to 260 days, and the above 28°F growing season ranges from 260 to 300 days. These soils are associated mainly with Agnew, Alderwood, Cassolary, Carlsborg, Clallam, Dick, Everett, Kitsap, and Sinclair soils.

In a representative profile in a wooded area, about 3 inches of needles, leaves, twigs, and decomposing organic matter cover the surface. The upper 10 inches of the soil is dark-gray and dark-brown gravelly loamy sand. Below this, to a depth of 26 inches, is dark yellowish-brown gravelly loamy sand. The underlying material consists of two dark grayish-brown layers. The upper layer, between depths of 26 and 44 inches, is gravelly loamy sand, and the lower layer, between depths of 44 and 60 inches, is very gravelly sand.

Most of the Hoypus soils are wooded. Besides production of trees, other important uses are limited pasture, home gardens, and homesites

Hoypus gravelly loamy sand, 0 to 15 percent slopes (HuC).—This nearly level soil is on rolling glacial moraine terraces. In most places slopes range from 6 to 12 percent.

Representative profile on south side of road in SW¼NE¼NE¼ sec. 16, T. 26 N., R. 1 W.:

O1—3 inches to 1 inch, needles, leaves, bark, and fragments of wood.
O2—1 inch to 0, black (5YR 2/1), partly decomposed organic matter from needles, leaves, bark, and fragments of wood, strongly acid, abrupt, wavy boundary. (½ to 1½ inches thick)
A2—0 to 1½ inches, dark-gray (10YR 4/1) gravelly loamy sand, gray (10YR 6/1) dry, weak, fine, granular structure; soft,

very friable, nonsticky, nonplastic, many fine and medium roots, 35 percent gravel, strongly acid, abrupt, wavy boundary. (1 to 3 inches thick)

B21ir—1½ to 10 inches, dark-brown (7.5YR 4/4) gravelly loamy sand, light brown (7.5YR 6/4) dry, reddish-brown (5YR 4/4) stains and coatings on surfaces of pebbles, single grained; loose, nonsticky, nonplastic; many fine and medium roots, 45 percent gravel; medium acid, clear, wavy boundary. (8 to 12 inches thick)

B22ir—10 to 26 inches, dark yellowish-brown (10YR 4/4) gravelly loamy sand, light yellowish brown (10YR 6/4) dry; single grained; loose, nonsticky, nonplastic; common fine roots; iron and manganese stains on some pebbles, 40 percent gravel, medium acid, clear, wavy boundary. (12 to 18 inches thick)

C1—26 to 44 inches, dark grayish-brown (10YR 4/2) gravelly loamy sand, light brownish gray (10YR 6/2) dry, single grained, loose, nonsticky, nonplastic, few fine roots, 45 percent gravel, medium acid, abrupt, wavy boundary. (10 to 20 inches thick)

C2—44 to 60 inches, dark grayish-brown (10YR 4/2) very gravelly sand, light brownish gray (10YR 6/2) dry; single grained, loose, nonsticky, nonplastic, 60 percent gravel, medium acid.

The A2 horizon is dark-gray to dark grayish-brown gravelly loamy sand or sandy loam. The B2 horizons are dark-brown or dark yellowish-brown gravelly loamy sand to gravelly fine sand. They are 35 to 70 percent gravel The C horizons are dark-gray or dark grayish-brown gravelly loamy sand or very gravelly loamy sand. In places at depths below 40 inches, there are compacted or weakly cemented layers. The B and C horizons are medium acid to slightly acid.

Included with this soil in mapping are small areas of somewhat poorly drained heavy silt loam.

This soil is somewhat excessively drained. Permeability is rapid. Roots penetrate to a depth of more than 60 inches. This soil holds 2 to 4 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This soil is used mainly for production of trees, recreation areas, and rural summer homesites. About 10 to 15 percent of the acreage is used for growing permanent pasture, hay, and home garden crops. Capability unit VIs-1; woodland group 4f2.

Hoypus gravelly loamy sand, 15 to 30 percent slopes (HuD).—This hilly soil is on glacial outwash terraces where they converge with the steep ravines and drainageways

Included with this soil in mapping are small areas of somewhat poorly drained heavy silt loam.

Runoff is medium, and the hazard of water erosion is moderate This soil is used mainly for producing trees and for wildlife habitat and recreation areas. Capability unit VIs-1; woodland group 4f2.

Hoypus gravelly loamy sand, 30 to 50 percent slopes (HuE).—This steep soil is on the sides of ravines and waterways below the terraces.

Runoff is medium to rapid, and the hazard of water erosion is moderate to severe. This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIs-1; woodland group 4f2.

Hoypus gravelly sandy loam, 0 to 15 percent slopes (HvC).—This nearly level to rolling soil is on glacial terraces. The upper 3 to 4 inches of this soil is gravelly fine sandy loam. Below this is 6 to 9 inches of dark-brown gravelly sandy loam.

This soil holds 3 to 4 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. About 15 to 20 percent of the acreage has been cleared and is used for growing permanent pasture, hay, and diversified home garden crops. Capability unit VIe-1; woodland group 4f2.

Huel Series

The Huel series consists of moderately well drained soils that formed in alluvium on nearly level, low river terraces. Slopes range from 0 to 3 percent. Elevation ranges from sea level to 300 feet. Native vegetation consists mostly of red alder, willow, cottonwood, western hemlock, Sitka spruce, bigleaf maple, annual grasses, and swordfern. Annual precipitation ranges from 120 to 160 inches. The average annual air temperature is about 49°F. The above 32°F growing season is about 180 days, and the above 28°F growing season is about 210 days. These soils are associated with Hoh and Queets soils.

In a representative profile in a wooded area, the upper 6 inches of the soil is dark olive-gray loamy fine sand. Beneath this, to a depth of 10 inches, is dark-gray fine sandy loam. The next layer, extending to a depth of 22 inches, is loamy fine sand. Beneath this, to a depth of 30 inches, is very dark gray very gravelly loamy sand. Below this is very gravelly coarse sand that extends to a depth of 60 inches.

Huel soils are used mainly for production of trees and for wildlife habitat and recreation areas.

Huel loamy fine sand (HW).—This nearly level soil is on low river terraces. The surface is dissected by many small stream channels. In most places slopes range from 0 to 3 percent.

Representative profile 100 feet east of Spur Road, 200 yards from Queets River Road in NE¼SE¼NW¼ sec. 20, T. 24 N., R. 11 W.:

A1—0 to 6 inches, dark olive-gray (5Y 3/2) loamy fine sand, light gray (5Y 7/2) dry; weak, coarse, granular structure; soft, very friable, nonsticky, nonplastic; many fine and medium roots, medium acid; clear, smooth boundary. (5 to 8 inches thick)

C1—6 to 10 inches, dark-gray (5Y 4/1) fine sandy loam, gray (5Y 6/1) dry, weak, thick, platy structure; soft, very friable, nonsticky, nonplastic, many fine and medium roots, medium acid; clear, smooth boundary. (3 to 6 inches thick)

C2—10 to 22 inches, dark-gray (5Y 4/1) loamy fine sand, gray (5Y 6/1) dry, massive, soft, very friable, nonsticky, nonplastic, many fine and medium roots, 6 bands, ¼ inch thick, of loamy very fine sand; medium acid, abrupt, smooth boundary. (12 to 16 inches thick)

IIC3—22 to 30 inches, very dark gray (5Y 3/1) very gravelly loamy sand, gray (5Y 6/1) dry; single grained; loose, nonsticky, nonplastic; common fine and medium roots; medium acid, clear, wavy boundary. (8 to 10 inches thick)

IIC4—30 to 60 inches, very dark gray (5Y 3/1) very gravelly coarse sand, gray (5Y 6/1) dry; single grained; loose, nonsticky, nonplastic; few roots; medium acid.

The A1 horizon is dark olive-gray, gray, or very dark grayish-brown loamy fine sand to fine sandy loam and 10 to 20 percent gravel. The C1 and C2 horizons are very dark gray, dark gray, or very dark grayish brown. They have thin layers of fine sandy loam and loamy fine sand that contain gravel in places. The IIC3 and IIC4 horizons have the same color ranges as the C1 and C2 horizons. They are very gravelly and cobbly coarse sand or very gravelly and cobbly loamy sand with thin layers of finer textures occurring at random Gravel and cobbles make up 60 to 70 percent of the IIC3 and IIC4 horizons.

Included with this soil in mapping are small areas of Hoh soils and Queets soils.

This soil is moderately well drained. Permeability is rapid. Roots can penetrate to a depth of more than 60 inches. This soil holds about 3 to 4 inches of water available for plants Runoff is slow, and the hazard of water erosion is

slight. A seasonal water table is at a depth of 3 to 5 feet. Flooding and channel erosion are hazards.

This soil is used mainly for production of trees, for growing pasture, and for wildlife habitat and recreation areas. Capability unit VIw-1; woodland group 3f1.

Indianola Series

The Indianola series consists of somewhat excessively drained soils that formed on eskers or kames in sandy glacial outwash. Slopes range from 0 to 50 percent. Elevation ranges from slightly above sea level to 1,000 feet. Native vegetation consists mainly of Douglas-fir, western hemlock, western redcedar, red alder, rhododendron, huckleberry, salal, Oregon grape, and bracken. Annual precipitation ranges from 26 to 55 inches The average annual air temperature is 50°F. The above 32°F growing season ranges from about 160 to 260 days, and the above 28°F growing season ranges from about 215 to 320 days. Variation in the length of the growing season at these temperatures depends mostly on elevation, and the soils at lower elevations have longer seasons Indianola soils are associated mainly with Alderwood, Cassolary, Everett, Hoypus, Kitsap, Quilcene, and Sinclair soils.

In a representative profile in a wooded area, about 5 inches of leaves, needles, bark, and humus cover the surface. The upper 10 inches of the soil is loamy sand that is very dark grayish brown in the upper part and strong brown in the lower part. Below this, to a depth of 28 inches, is brown loamy sand Beneath this, and extending to a depth of 60 inches, are layers ranging in texture from medium sand to loamy fine sand.

Most areas of Indianola soils are wooded (fig. 6). Besides production of trees, another important use of these soils is for permanent and summer rural homesites. Less than 25 percent of the acreage of these soils has been cleared. This acreage is used for growing various minor crops.

Indianola loamy sand, 0 to 15 percent slopes (InC).—This nearly level to strongly sloping soil is on glacial outwash plains. In most places slopes range from 4 to 10 percent.

***Figure 6.*—Area of pruned and thinned Douglas-fir on Indianola loamy sand.**

Representative profile 726 feet south and 1,056 feet west of the northeast corner of sec. 2, T. 28 N., R. 1 W.:

O1—3 inches to 2 inches, leaves, needles, bark, and fragments of wood.

O2—2 inches to 0, black (10YR 2/1), partly decayed leaves, needles, bark, and fragments of wood, dark gray (10YR 4/1) dry, strongly acid, abrupt, wavy boundary. (1 to 2 inches thick)

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry, weak, fine, granular structure, soft, very friable, nonsticky, nonplastic, many fine and medium roots, medium acid, abrupt, irregular boundary. (2 to 3 inches thick)

B21ir—2 to 10 inches, strong-brown (7 5YR 5/6) loamy sand, brownish yellow (10YR 6/6) dry, weak, fine, subangular blocky structure, soft, very friable, nonsticky, nonplastic, many fine and medium roots, slightly acid, clear, wavy boundary. (8 to 10 inches thick)

B22ir—10 to 21 inches, brown (7 5YR 5/4) loamy sand, light yellowish brown (10YR 6/4) dry, weak, fine and medium, subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine and medium roots, medium acid, clear, wavy boundary (10 to 12 inches thick)

B3—21 to 28 inches, brown (10YR 5/3) loamy sand, very pale brown (10YR 7/3) dry, weak, fine and medium, subangular blocky structure, soft, very friable, nonsticky, nonplastic, common fine and medium roots, slightly acid, clear, wavy boundary (7 to 9 inches thick)

C1—28 to 34 inches, light olive-brown (2 5Y 5/4) loamy sand, pale yellow (2 5Y 7/4) dry; single grained, loose, nonsticky, nonplastic; few fine roots, slightly acid; clear, wavy boundary. (6 to 8 inches thick)

C2—34 to 53 inches, dark grayish-brown (2.5Y 4/2) fine and medium sand, light brownish gray (2.5Y 6/2) dry, single grained, loose, nonsticky, nonplastic, few fine roots, slightly acid, clear, wavy boundary (18 to 22 inches thick)

C3—53 to 60 inches, grayish-brown (2.5Y 5/2) loamy fine sand, light gray (2 5Y 7/2) dry, single grained, loose, nonsticky, nonplastic; few fine roots; neutral. (3 to many feet thick)

The A1 and B21ir horizons range from very dark grayish brown to strong brown. The B22ir and B3 horizons range from brown to dark yellowish brown. The C horizons are loamy sand and fine and medium sand. Colors range from dark grayish brown to light olive brown. Fine gravel covers 5 to 15 percent of the surface and makes up 5 to 15 percent of the material throughout the profile In small areas the C3 horizon below a depth of 50 inches is firm loamy fine sand that has accumulations of gritty, reddish-brown or yellowish-red iron oxides.

Included with this soil in mapping are small areas of Alderwood, Kitsap, and Quilcene soils.

This soil is somewhat excessively drained. Permeability is rapid. This soil holds about 3 to 5 inches of water available for plants. Runoff is slow, and the hazard of water erosion is slight to moderate. Roots penetrate to a depth of more than 60 inches.

This soil is somewhat excessively drained. Permeability is rapid. This soil holds about 3 to 5 inches of water available for plants. Runoff is slow, and the hazard of water erosion is slight to moderate. Roots penetrate to a depth of more than 60 inches.

This soil is used mainly for producing trees and for wildlife habitat and recreation areas. About 20 percent of the acreage has been cleared and is used for growing permanent pasture, hay, and home garden crops. Capability unit VIs-1; woodland group 4s2.

Indianola loamy sand, 15 to 30 percent slopes (InD).—This moderately steep soil is on glacial moraine terraces where they converge with the rolling outwash terraces above and the steep ravines and drainageways below.

Included with this soil in mapping are small areas of gravelly soils and soils that have an iron-cemented hardpan below a depth of 2 feet.

Runoff is medium, and the hazard of water erosion is

moderate. This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIs-1, woodland group 4s2.

Indianola sandy loam, 0 to 15 percent slopes (IoC).—This nearly level to strongly sloping soil is sandy loam to a depth of 8 to 12 inches Runoff is slow to medium. The soil holds 4 to 6 inches of water available for plants.

This soil is used mainly for producing trees and for wildlife habitat and recreation areas. About 40 percent of the acreage is used for growing such crops as pasture, hay, small grains, berries, and vegetables. Capability unit IVe-2, woodland group 3o2.

Indianola sandy loam, 15 to 50 percent slopes (IoE).—This soil is sandy loam to a depth of 8 to 12 inches. It is on the moderately steep glacial terraces and on the steep sides of ravines.

Included with this soil in mapping are small areas of Cassolary, Alderwood, Kitsap, Quilcene, and Sinclair soils.

This soil holds 4 to 6 inches of water available for plants. Runoff is medium to rapid, and the hazard of water erosion is moderate to severe.

This soil is used mainly for producing trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3o2

Itswoot Series

The Itswoot series consists of well-drained, very cobbly soils that formed in glacial till and weathered sandstone, shale, and other local sedimentary and metamorphic rock. Slopes range from 0 to 60 percent. Elevation ranges from about 500 to 2,000 feet. Native vegetation consists mostly of western hemlock, western redcedar, Pacific silver fir, Sitka spruce, vine maple, salmonberry, huckleberry, swordfern, and deerfern. Annual precipitation ranges from 130 to 170 inches The average annual air temperature is 47°F to 49°F. The above 32°F growing season ranges from 140 to 170 days, and the above 28°F growing season ranges from 190 to 220 days. These soils are associated mainly with Hoko, Klone, Snahopish, and Solleks soils.

In a representative profile in a wooded area, about 3½ inches of litter and humus cover the surface. The upper 4 inches of soil is dark-brown cobbly silt loam. Below this, to a depth of 9 inches, is dark-brown very cobbly silt loam that is 55 percent rounded and angular cobbles and pebbles. The next layer, to a depth of 21 inches, is strong-brown very cobbly silty clay loam that is 60 to 65 percent rounded and angular cobbles and pebbles. Beneath this, and extending to a depth of 40 inches, is yellowish-brown very cobbly silty clay loam. Below this, to a depth of 60 inches, is brownish-yellow silty clay loam that is 65 percent rounded and angular cobbles and pebbles.

Itswoot soils are used mainly for production of trees and for wildlife habitat and recreation areas.

Itswoot very cobbly silt loam, 0 to 30 percent slopes (ITD).—This nearly level to hilly soil is on mountainous footslopes and glacial terraces. In most places slopes range from 20 to 30 percent.

Representative profile 1½ miles east of Matheny Creek on the Sams River Road in the NW¼SW¼SE¼ sec. 1, T. 24 N., R. 10 W., 10 feet south of road:

O1—3½ inches to 1½ inches, needles, leaves, twigs, bark, and moss.
O2—1½ inches to 0, dark reddish-brown (5YR 2/2), decomposing forest litter, very strongly acid.
A1—0 to 4 inches, dark-brown (7.5YR 3/2) cobbly silt loam, brown (7.5YR 5/2) dry, moderate, very fine and fine, granular structure; slightly hard, friable, nonsticky, slightly plastic; many fine, medium, and coarse roots; 40 percent rounded and angular cobbles and pebbles; strongly acid, clear, wavy boundary. (3 to 6 inches thick)
B1 4 to 9 inches, dark-brown (7 5YR 4/4) very cobbly silt loam, light brown (7.5YR 6/4) dry; moderate, fine and medium, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; 55 percent rounded and angular cobbles and pebbles; strongly acid; gradual, wavy boundary. (4 to 8 inches thick)
B21—9 to 21 inches, strong-brown (7 5YR 5/6) very cobbly silty clay loam, reddish yellow (7.5YR 7/6) dry; moderate, fine and medium, subangular blocky structure; hard, firm, sticky, plastic; common fine and medium roots, 65 percent rounded and angular cobbles and pebbles, medium acid; gradual, wavy boundary (10 to 15 inches thick)
B22—21 to 40 inches, yellowish-brown (10YR 5/6) very cobbly silty clay loam, yellow (10YR 7/6) dry, weak, coarse, angular blocky structure; hard, firm, sticky, plastic; few fine roots; 65 percent rounded and angular cobbles and pebbles; medium acid, gradual, wavy boundary (16 to 22 inches thick)
B3—40 to 60 inches, brownish-yellow (10YR 6/6) very cobbly silty clay loam, yellow (10YR 7/6) dry; weak, coarse, angular blocky structure; hard, firm, sticky, plastic; 65 percent rounded and angular cobbles and pebbles; medium acid.

The A horizon is dark-brown to dark reddish-brown very cobbly silt loam, cobbly silt loam, or gravelly silt loam. The B horizons are strong brown to brownish yellow. They are very cobbly silt loam or very cobbly silty clay loam.

Included with this soil in mapping are small areas where the surface layer is silty clay loam.

This soil is well drained. Permeability is moderately slow. Roots penetrate to a depth of 60 inches. This soil holds about 5 to 7 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate

This soil is used for production of trees and for wildlife habitat and recreation areas. Capability unit VIs-1; woodland group 3f1.

Itswoot very cobbly silt loam, 30 to 60 percent slopes (ITF).—This steep to very steep soil is on mountainsides. It contains about equal amounts of cobblestones and channery-flaggy fragments.

Included with this soil in mapping are small areas where the surface layer is gravelly loam or very gravelly loam.

Runoff is rapid to very rapid, and the hazard of water erosion is severe to very severe. This soil is used for production of trees and for wildlife habitat and recreation areas. Capability unit VIs-1; woodland group 3f1.

Kalaloch Series

The Kalaloch series consists of well-drained soils that formed in glaciofluvial sediments on high river terraces and low glacial terraces. Slopes range from 0 to 15 percent. Elevation ranges from slightly above sea level to about 400 feet. Native vegetation consists mostly of western hemlock, Sitka spruce, red alder, western redcedar, vine maple, salmonberry, salal, huckleberry, swordfern, and deerfern. Annual precipitation ranges from 120 to 150 inches. The average annual air temperature is about 49°F. The above 32°F growing season ranges from 170 to 200 days, and the above 28°F growing season ranges from 190 to 210 days. These soils are associated mainly with the Hoh, Huel, Klone, and Queets soils.

In a representative profile in a wooded area, a 4-inch layer of forest litter and humus covers the surface. The upper 8

inches of the soil is very strongly acid loam that is dark brown in the upper part and dark yellowish brown in the lower part. Below this, to a depth of 13 inches, is dark grayish-brown, very strongly acid loam. Beneath this, to a depth of 60 inches, are stratified layers of very strongly acid, dark grayish-brown and dark-gray fine sandy loam, loamy fine sand, and fine sand.

Kalaloch soils are used mainly for production of trees and for recreation areas, rural homesites, and wildlife habitat.

Kalaloch loam, 0 to 8 percent slopes (KAB).—This nearly level to undulating soil is on old river terraces that are above normal flood stage. In most places slopes are 2 to 5 percent

Representative profile ½ mile northeast of shake mill on U.S. Highway 101 in the NW¼SW¼SE¼ sec. 7, T. 26 N., R. 12 W.:

O1—4 inches to 1 inch, needles, leaves, fragments of wood, and moss.
O2—1 inch to 0, dark reddish-brown (5YR 2/2) organic litter, very strongly acid.
B21ir—0 to 2 inches, dark-brown (7.5YR 4/4) loam, light brown (7.5YR 6/4) dry; moderate, medium and coarse, granular structure, slightly hard, friable, nonsticky, slightly plastic; many roots; very strongly acid, clear, smooth boundary (2 to 3 inches thick)
B22—2 to 8 inches, dark yellowish-brown (10YR 4/4) loam, light yellowish brown (10YR 6/4) dry; moderate, medium and coarse, subangular blocky structure; slightly hard, friable, nonsticky, slightly plastic; many roots, very strongly acid; clear, wavy boundary. (4 to 8 inches thick)
B3 8 to 13 inches, dark grayish-brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak, medium and thick, platy structure, slightly hard, friable, nonsticky, slightly plastic, many roots, very strongly acid, gradual, wavy boundary. (4 to 10 inches thick)
C1—13 to 25 inches, dark grayish-brown (2.5Y 4/2) fine sandy loam, light brownish gray (2.5Y 6/2) dry, massive, slightly hard, very friable, nonsticky, nonplastic, common roots; very strongly acid, clear, smooth boundary. (8 to 12 inches thick)
IIC2—25 to 33 inches, dark-gray (5Y 4/1) loamy fine sand, gray (5Y 6/1) dry, massive, soft, very friable, nonsticky, nonplastic; common roots, very strongly acid; clear, smooth boundary. (6 to 10 inches thick)
IIC3—33 to 60 inches, dark-gray (5Y 4/1) fine sand, gray (5Y 6/1) dry, massive; soft, nonsticky, nonplastic, few roots, very strongly acid.

The B2 horizons are dark brown, very dark grayish brown, and dark yellowish brown In places the upper 2 to 3 inches of the B2 horizons is loam, very fine sandy loam, or silt loam. The B3 horizon is dark grayish brown, dark yellowish brown, and yellowish brown. It is stratified in places with loam, fine sandy loam, sandy loam, and occasional thin layers of silt loam. The C1 horizon ranges from dark grayish brown to dark gray Textures are fine sandy loam, loamy fine sand, gravelly loamy sand, fine sand, and medium sand. Gravel content ranges from 5 to 35 percent in the B horizons and from 5 to 35 percent in the C horizons Reaction throughout the profile ranges from very strongly acid to strongly acid.

Included with this soil in mapping are small areas of loamy fine sand

This soil is well drained. Permeability is moderate in the upper part and rapid in the lower part. Roots penetrate to a depth of more than 60 inches. This soil holds 5 to 7 inches of water available for plants. Runoff is slow, and the hazard of water erosion is slight. Areas immediately adjacent to rivers and creeks are subject to slippage during periods of high water.

This soil is used mainly for production of trees and for wildlife habitat, recreation areas, and rural homesites. A few permanent residents have cleared small areas of this soil to grow home garden crops or to provide pasture for livestock. Capability unit VIe-1; woodland group 2o1.

Kalaloch gravelly loam, 0 to 15 percent slopes (KCC).—This nearly level to strongly sloping soil is on glacial outwash terraces. It is gravelly loam and is 20 to 35 percent gravel to a depth of about 2 feet. The substratum consists of stratified, coarse-textured layers that are 20 to 75 percent gravel.

The hazard of water erosion is slight to moderate Roots penetrate to a depth of 60 inches. The soil holds 4 to 6 inches of water available for plants.

Kalaloch gravelly loam is used mainly for production of trees and for widllife habitat and recreation areas. Capability unit VIe-1, woodland group 3o1.

Kitsap Series

The Kitsap series consists of moderately well drained soils that formed in glacial lacustrine or marine sediments on upland benches, terraces, canyon slopes, and ocean bluffs. Slopes range from 0 to 50 percent. Elevation ranges from slightly above sea level to about 500 feet Native vegetation consists mainly of Douglas-fir, western redcedar, western hemlock, red alder, bigleaf maple, red elderberry, salmonberry, and swordfern Annual precipitation is 25 to 45 inches. The average annual air temperature is 50°F. The above 32°F growing season ranges from about 170 to 230 days, and the above 28°F growing season ranges from about 230 to 280 days. The Kitsap soils are associated mainly with Alderwood, Cassolary, Everett, Hoypus, Indianola, and Sinclair soils.

In a representative profile in a wooded area, the upper 4 inches is dark-brown silt loam Below this, to a depth of 14 inches, is dark yellowish-brown silt loam. The next layer, extending to a depth of 21 inches, is dark grayish-brown silt loam. Beneath this, and extending to a depth of 32 inches, is olive-brown silty clay loam. Below this, to a depth of 60 inches, is stratified grayish-brown and dark-grayish brown gravelly silty clay loam, silt loam, and silty clay loam.

Most areas of Kitsap soils are wooded. In addition to production of trees, another important use is for small ranches and rural homesites.

Kitsap silt loam, 0 to 15 percent slopes (KtC).—This nearly level to rolling soil is on terraces and benches. In most places slopes range from 4 to 9 percent

Representative profile 50 yards west side State Highway 9E, 2.1 miles south of Shire Road junction in SW¼SW¼ sec. 9, T. 27 N., R. 1 E.

O1—1½ inches to ½ inch, leaves, needles, and twigs.
O2—½ inch to 0, decomposing organic matter.
A1—0 to 4 inches, dark-brown (7.5YR 4/3) silt loam, grayish brown (10YR 5/2) dry, moderate, granular structure, slightly hard, very friable, nonsticky, slightly plastic, common fine and medium roots; common fine concretions; medium acid; clear,smooth boundary. (3 to 5 inches thick)
B21—4 to 14 inches, dark yellowish-brown (10YR 4/4) silt loam, light brownish gray (10YR 6/2) dry; moderate, fine, subangular blocky structure, slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots; slightly acid, clear, smooth boundary. (8 to 12 inches thick)
B22—14 to 21 inches, dark grayish-brown (10YR 4/2) silt loam, light brownish gray (10YR 8/2) dry, moderate, medium, prismatic structure, hard, firm, slightly sticky, plastic, few fine and medium roots, slightly acid, gradual, wavy boundary. (6 to 8 inches thick)
IIB3—21 to 32 inches, olive-brown (2.5Y 4/4) silty clay loam, light yellowish brown (2.5Y 6/4) dry, common, medium, faint yellowish-brown (10YR 5/6) mottles, weak, coarse, prismatic structure that parts to weak, fine, subangular blocky, some stratification, very hard, firm, slightly sticky, slightly plastic; few fine roots, slightly acid, gradual, wavy boundary. (10 to 14 inches thick)

IIIC1—32 to 39 inches, grayish-brown (2.5Y 5/2) gravelly silty clay loam, light gray (2 5Y 7/2) dry; few, medium, distinct strong-brown (7.5YR 5/6) mottles, massive, stratified, very hard, firm, slightly sticky, slightly plastic, no roots, about 30 percent small and medium rounded pebbles, slightly acid; clear, wavy boundary. (6 to 10 inches thick)

IVC2 39 to 54 inches, dark grayish-brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry, few, medium, distinct strong-brown (7 5YR 5/6) mottles; massive; stratified; slightly hard, friable, slightly sticky, slightly plastic; slightly acid, smooth, clear boundary. (12 to 16 inches thick)

VC3 –54 to 60 inches, dark grayish-brown (10YR 4/2) silty clay loam, light gray (10YR 7/2) dry, massive, stratified, very hard, firm, slightly sticky, plastic, slightly acid.

The A horizon is dark-brown silt loam mixed with 3 to 8 percent fine gravel and numerous small, very dark grayish-brown, soft concretions. The B21 and B22 horizons are dark yellowish-brown to dark grayish-brown silt loam. The IIB3 horizon is brown silty clay loam that contains thin strata of silty clay, sandy loam, loamy sand, or sand, and in places, a few fine pebbles. The IIIC1 horizon is grayish-brown gravelly silty clay loam or silty clay. The IVC2 and VC3 horizons, between depths of 39 and 60 inches, are dark grayish-brown silt loam to silty clay that contains thin strata or seams of fine sandy loam, loamy sand, or fine sand, and, in places, some scattered fine pebbles.

Included with this soil in mapping are small areas of Kitsap silt loam, 15 to 30 percent slopes, Kitsap gravelly loam, 0 to 30 percent slopes, and small areas at Alderwood, Sinclair, Cassolary, Everett, Hoypus, and Indianola soils.

This soil is moderately well drained. Permeability is very slow. Roots penetrate to a depth of 30 to 40 inches. This soil holds 6 to 8 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate A perched water table is at a depth of 1½ to 3 feet

This soil is used mainly for production of trees and for recreation areas, rural homesites, and wildlife habitat. Small acreages under cultivation are used for growing pasture, hay, and home garden crops. Capability unit IIIe-1; woodland group 2d2.

Kitsap silt loam, 15 to 30 percent slopes (KtD). This hilly soil is on terraces that converge along the breaks of steep ravines or ocean bluffs.

Included with this soil in mapping are small areas of somewhat excessively drained soils.

Runoff is medium to rapid, and the hazards of erosion and slippage are moderate to severe

This soil is used mainly for production of trees and for recreation areas and wildlife habitat. Small acreages are used for rural homesites and for growing pasture, hay, and home garden crops. Capability unit IVe-3; woodland group 2d2

Kitsap silt loam, 30 to 50 percent slopes (KtE).—This steep soil is on canyon sides and ocean bluffs. The surface layer and subsoil are thinner along the upper part of the slopes than they are along the lower part of the slopes

Included with this soil in mapping are small areas of somewhat excessively drained soils.

Runoff is rapid, and the hazards of erosion and slippage are severe.

This soil is used mainly for production of trees and for recreation areas and wildlife habitat. Capability unit VIe-1; woodland group 2d2.

Kitsap gravelly loam, 0 to 15 percent slopes (KsC).—This nearly level to rolling soil is gravelly loam to a depth of about 30 inches. The substratum, 15 inches to several feet thick, is light olive-brown, firm to very firm, compact silty clay loam. This soil holds 5 to 7 inches of water available for plants.

This soil is used mainly for production of trees and for recreation areas, rural homesites, and wildlife habitat. Small acreages under cultivation are used for growing pasture, hay, and home garden crops. Capability unit IVe-1; woodland group 3d2.

Kitsap gravelly loam, 15 to 30 percent slopes (KsD).—This hilly soil is on terraces that converge along the breaks of steep ravines or ocean bluffs. It is gravelly loam to a depth of about 30 inches.

This soil holds 5 to 7 inches of water available for plants. Runoff is medium to rapid, and the hazards of erosion and slippage are moderate to severe.

This soil is used mainly for production of trees and for recreation areas and wildlife habitat Small acreages are used for rural homesites and for growing pasture, hay, and home garden crops. Capability unit VIe-1; woodland group 3d2.

Klone Series

The Klone series consists of well-drained, gravelly and cobbly soils that formed in glacial till and outwash on terraces and plains. Slopes range from 0 to 60 percent. Elevation ranges from about 50 to 1,500 feet. Native vegetation consists mostly of western hemlock, Pacific silver fir, western redcedar, Sitka spruce, vine maple, salal, huckleberry, swordfern, and deerfern. Annual precipitation ranges from 120 to 170 inches. The average annual air temperature is 47°F to 50°F. The above 32°F growing season ranges from 170 to 195 days, and the above 28°F growing season ranges from 180 to 220 days. These soils are associated mainly with Hoko, Itswoot, Kalaloch, and Tealwhit soils.

In a representative profile a thin layer of organic litter covers the surface. The upper 7 inches of the soil is dark reddish-brown, very strongly acid gravelly silt loam. Below this, to a depth of 36 inches, is dark-brown and strong-brown gravelly silt loam that is 35 to 45 percent gravel. The next layer, to a depth of 41 inches, is dark-brown very gravelly sandy loam that is 75 percent gravel and cobbles. Below this, to a depth of 60 inches, is dark grayish-brown very gravelly loamy sand that is 70 percent stratified gravel and cobbles.

Klone soils are used for production of trees and for wildlife habitat and recreation areas.

Klone gravelly silt loam, 0 to 30 percent slopes (KGD).—This nearly level to hilly soil is on glacial terraces and moraines. Slopes are mostly 3 to 25 percent.

Representative profile 0.5 mile northwest of Queets River Bridge on U.S. Highway 101 in SW¼SW¼SW¼ sec 26, T. 24 N., R. 13 W.:

O1—4 inches to 1 inch, needles, leaves, twigs, bark, and moss.

O2—1 inch to 0, dark reddish-brown (5YR 2/2), decomposing forest litter, very strongly acid.

A1—0 to 7 inches, dark reddish-brown (5YR 3/2) gravelly silt loam, reddish gray (5YR 5/2) dry, moderate, medium and coarse, granular structure; slightly hard, friable, nonsticky, slightly plastic, many fine, medium, and coarse roots, 30 percent rounded, medium and large pebbles, very strongly acid; clear, wavy boundary. (5 to 9 inches thick)

B1 7 to 12 inches, dark-brown (7.5YR 3/4) gravelly silt loam, brown (7.5YR 5/4) dry; moderate, fine and medium, subangular blocky structure, hard, friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; 35 percent rounded, medium and large pebbles; very strongly acid; clear, wavy boundary. (4 to 7 inches thick)

B21—12 to 19 inches, dark-brown (7.5YR 4/4) gravelly silt loam, light brown (7.5YR 6/4) dry; common, fine, distinct dark

reddish-brown (5YR 3/2) mottles; moderate, fine, subangular blocky structure, hard, friable, slightly sticky, plastic, common fine and medium roots, 40 percent rounded, medium and large pebbles, strongly acid; clear, wavy boundary. (5 to 8 inches thick)

B22—19 to 36 inches, strong-brown (7.5YR 5/6) gravelly silt loam, reddish yellow (7.5YR 7/6) dry; moderate, very fine and fine, subangular blocky structure, hard, friable, slightly sticky, plastic, common fine and medium roots, 45 percent rounded, medium and large pebbles and cobbles, medium acid, clear, wavy boundary. (14 to 20 inches thick)

IIC1—36 to 41 inches, dark-brown (7.5YR 4/4) very gravelly sandy loam, light brown (7 5YR 6/4) dry, black and dark reddish brown (5YR 2/1 and 2/2) stains on pebbles, massive, very hard, very firm, slightly sticky, nonplastic, very weakly cemented, 75 percent rounded pebbles and cobbles, thin cutans on some pebbles and cobbles, medium acid; gradual, wavy boundary. (4 to 7 inches thick)

IIC2—41 to 60 inches, dark grayish-brown (10YR 4/2) very gravelly loamy sand, light brownish gray (10YR 6/2) dry, massive; soft, firm, nonsticky, nonplastic, 70 percent rounded, stratified pebbles and cobbles of various sizes, slightly acid.

The A horizon ranges from gravelly silt loam to cobbly loam The B horizons are dark-brown, strong-brown, reddish-brown, brown, and dark yellowish-brown gravelly silt loam to gravelly sandy loam. Gravel and cobbles make up 35 to 50 percent of these horizons The C horizons are dark-brown to dark grayish-brown loamy sand, medium sand, and coarse sand and are 50 to 75 percent gravel and cobbles Black, dark reddish-brown, and reddish-brown stains are on pebbles and cobbles. Where slopes are 20 to 30 percent, the combined A and B horizons are 5 to 10 inches thinner than they are where slopes are less steep.

Included with this soil in mapping are small areas of Tealwhit soils.

This soil is well drained. Permeability is moderate in the surface layer and subsoil and moderately rapid in the substratum. Roots penetrate to a depth of 60 inches This soil holds about 5 to 7 inches of water available for plants Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This soil is used mainly for production of trees and for wildlife habitat, recreation areas, and rural homesites. Capability unit VIe-1, woodland group 2f1.

Klone gravelly silt loam, 30 to 60 percent slopes (KGF).—This steep and very steep soil is on upper glacial terraces along the mountain foothills The substratum is more compact where slope is steeper than it is elsewhere.

Runoff is rapid to very rapid, and the hazard of water erosion is severe to very severe.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 2f1.

Klone cobbly loam, 0 to 30 percent slopes (KLD). — The upper part of this soil contains numerous glacial cobbles. This soil holds 3 to 5 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This soil is used mainly for production of trees and for wildlife habitat, recreation areas, and rural homesites. Capability unit VIe-1, woodland group 3f1

Klone cobbly loam, 30 to 60 percent slopes (KLF).—This soil is steep and very steep, and its upper part contains numerous glacial cobbles. The soil holds 3 to 5 inches of water available for plants. Runoff is rapid to very rapid, and the hazard of water erosion is severe to very severe

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3f1.

Klone-Hoko association, moderately steep (KND).—This soil association consists of about 30 percent Klone gravelly silt loam, 0 to 30 percent slopes, 30 percent Klone cobbly loam, 0 to 30 percent slopes, and about 40 percent Hoko gravelly silt loam, 15 to 30 percent slopes. The Klone soils are gently sloping to moderately steep, and the Hoko soil is mostly hilly.

Included with this soil in mapping are small areas of poorly drained silty clay loam.

The soils of this association are used mainly for production of trees and for wildlife habitat, recreation areas, and rural homesites. Capability unit VIe-1; woodland group 3f1.

Klone-Tealwhit association, sloping (KOC).—This association consists of about 65 percent Klone gravelly silt loam, 0 to 30 percent slopes, and about 35 percent Tealwhit silty clay loam, 0 to 8 percent slopes. The Tealwhit soil is nearly level to gently sloping, and the Klone soil is mostly undulating to moderately steep.

The soils of this association are used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1, woodland group 3f1

Lummi Series

The Lummi series consists of poorly drained soils that formed in stratified marine and alluvium in lowland areas adjacent to river estuaries and tidal salt marshes slightly above sea level. Slopes range from 0 to 3 percent. Native vegetation consists mostly of saltwater-tolerant reeds, sedges, and grasses and wild rose, spirea, and a few scattered alder, willow, cottonwood, western hemlock, Douglars-fir, and western redcedar. Annual precipitation is 30 to 50 inches. The average annual air temperature is about 50°F. The above 32°F growing season is about 260 days, and the above 28°F growing season is about 320 days. These soils are associated mainly with Belfast and Wapato soils.

In a representative profile the upper 10 inches of the soil is dark-brown silt loam Below this, to a depth of 18 inches, is very dark grayish-brown loam that has prominent, yellowish-red mottles The next layer, extending to a depth of 27 inches, is dark-gray silt loam that has reddish-brown and black mottles. Below this, to a depth of 29 inches, is heavy silt loam that has yellowish-red mottles and contains partly decomposed sedges. Beneath this, and extending to a depth of 60 inches, is very dark gray heavy silt loam that has a few reddish-brown and yellowish-brown mottles. These soils are slightly acid to neutral throughout.

Most of the acreage of Lummi soils is in permanent or brushy pasture. About 30 percent of the acreage is in brushy timber and is used mainly for wildlife habitat and recreation areas.

Lummi silt loam (Lu) —This nearly level soil is on river estuaries adjacent to tidal flats and within 2 to 4 feet of the average high tide. Slopes are mostly less than 2 percent.

Representative profile 0.3 mile east of the Big Quilcene River bridge in the SW¼SE¼NE¼ sec. 24, T. 27 N , R. 2 W , under the Bonneville powerline:

Ap—0 to 5 inches, dark-brown (10YR 3/3) silt loam, grayish brown (10YR 5/2) dry, moderate, medium, granular and weak, fine, subangular blocky structure, slightly hard, friable, slightly sticky, slightly plastic, many fine roots, slightly acid, clear, wavy boundary. (4 to 5 inches thick)

A1—5 to 10 inches, dark-brown (10YR 3/3) silt loam, grayish brown (10YR 5/2) dry, weak, medium, prismatic and moderate, medium, subangular blocky structure, slightly hard, friable, nonsticky, slightly plastic, many fine roots, slightly acid, clear, smooth boundary. (4 to 6 inches thick)

IIB21g 10 to 18 inches, very dark grayish-brown (2.5Y 3/2)

loam, grayish brown (2.5Y 5/2) dry; common, fine, prominent yellowish-red (5YR 4/6) mottles; weak, medium, prismatic structure; slightly hard, friable, slightly sticky, plastic; common fine roots; thin, continuous clay films in fine pores and yellowish-red (5YR 5/6) fillings in medium pores, slightly acid; clear, wavy boundary. (7 to 9 inches thick)

IIIB22g—18 to 27 inches, dark-gray (10YR 4/1) silt loam, light brownish gray (10YR 6/2) dry, common, medium, prominent reddish-brown (5YR 4/4) mottles and common, fine, distinct black (10YR 2/1) mottles, moderate, medium, subangular blocky structure; hard, firm, sticky, plastic; few fine roots; thin, continuous clay films in pores; slightly acid; abrupt, smooth boundary. (8 to 10 inches thick)

IVB3g—27 to 29 inches, very dark gray (5Y 3/1) heavy silt loam, olive gray (5Y 5/2) dry; many, coarse, prominent yellowish-red (5YR 4/6) mottles in the form of disseminated, platy orterde, weak, medium, subangular blocky structure; hard, firm, slightly sticky, plastic, few fine roots, thin, continuous clay films in pores; partly decomposed, black remnants of sedges; slightly acid; gradual, smooth boundary. (1 to 6 inches thick)

IVCg—29 to 60 inches, very dark gray (5Y 3/1) heavy silt loam, gray (5Y 5/1) dry; few, medium, prominent reddish-brown (5YR 4/4) and yellowish-brown (10YR 5/8) mottles, massive; hard, firm, slightly sticky, plastic, few fine roots; slightly acid.

The A horizons are dark-brown, dark-gray, or olive-gray silt loam to fine sandy loam. The B horizons are very dark grayish-brown, very dark gray, dark-gray, dark olive-gray, or black silt loam or loam that has distinct to prominent mottles throughout. The C horizon is very dark gray, dark-gray, or dark olive-gray heavy silt loam or loam. Reaction ranges from slightly acid to neutral throughout.

Included with this soil in mapping are small areas of organic soils.

This soil is poorly drained. Permeability is moderate. Roots penetrate to a depth of 60 inches or more. This soil holds 10 to 12 inches of water available for plants. Runoff is very slow to ponded, and the hazard of erosion is slight or nonexistent except along stream channels. A seasonal water table is at a depth of 1 to 2 feet.

About half the acreage of this soil is cleared and used for growing pasture, hay, or silage. Small areas are used for growing home garden crops such as berries, bulbs, and vegetables. The rest is used for brushy pasture and livestock grazing and for wildlife habitat, recreation areas, and rural homesites. Capability unit IIIw-1; woodland group 4w2.

Lystair Series

The Lystair series consists of somewhat excessively drained soils that formed on plains and terraces in glacial material. Slopes range from 0 to 15 percent. Elevation ranges from slightly above sea level to about 750 feet. Native vegetation consists mostly of Douglas-fir, western hemlock, western redcedar, bigleaf maple, red alder, huckleberry, and salal. Annual precipitation ranges from 60 to 70 inches. The average annual air temperature is about 50°F. The above 32°F growing season is about 160 days, and the above 28°F growing season is about 220 days. These soils are associated mainly with Ahl, Grove, and Hoodsport soils.

In a representative profile the upper 14 inches of the soil is dark-brown fine sandy loam. Below this, to a depth of 27 inches, is dark yellowish-brown or dark-brown loamy fine sand. Beneath this, and extending to a depth of 60 inches, is dark grayish-brown and very dark grayish-brown loamy fine sand and fine sand.

Most of the acreage of Lystair soils is wooded. The soils are used mainly for production of trees and for summer homesites.

Lystair fine sandy loam, 0 to 15 percent slopes (LyC).—This nearly level to strongly sloping soil is on glacial outwash plains and moraine terraces. In most places slopes range from 4 to 10 percent.

Representative profile 1,840 feet south of the north quarter corner of sec. 34, T. 26 N., R. 2 W. on Dosewallips River Road:

A1—0 to 1 inch, dark-brown (7.5YR 3/2) fine sandy loam, brown (7.5YR 5/2) dry; weak, very fine, granular structure; soft, very friable, nonsticky, nonplastic, many fine and medium roots; slightly acid; clear, wavy boundary. (1 to 3 inches thick)

B21ir—1 to 14 inches, dark-brown (7.5YR 3/4) fine sandy loam, brown (7.5YR 5/4) dry, weak, fine, subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine and medium roots, few slightly hard medium nodules; neutral, gradual, wavy boundary. (12 to 15 inches thick)

B22ir—14 to 22 inches, dark yellowish-brown (10YR 3/4) loamy fine sand, yellowish brown (10YR 5/4) dry; weak, fine, subangular blocky structure; soft, very friable, nonsticky, nonplastic, many fine and medium roots; many hard to very hard medium and coarse nodules; neutral; clear, wavy, boundary. (8 to 10 inches thick)

B3—22 to 27 inches, dark-brown (10YR 3/3) loamy fine sand, brown (10YR 5/3) dry; weak, medium and coarse, subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine and medium roots; many hard to very hard medium and coarse nodules; neutral; clear, wavy boundary. (4 to 6 inches thick)

C1—27 to 46 inches, dark grayish-brown (2.5Y 4/2) loamy fine sand, grayish brown (2.5Y 5/2) dry, few, medium, distinct yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) mottles when moist, massive; soft, very friable, nonsticky, nonplastic; few fine and medium roots, many hard to very hard medium and coarse nodules; neutral; gradual, wavy boundary. (8 to 10 inches thick)

C2—46 to 60 inches, very dark grayish-brown (2.5Y 3/2) fine sand, dark grayish brown (2.5Y 4/2) dry; single grained; loose, nonsticky, nonplastic, few fine roots, neutral.

The A1 horizon and the B21ir horizon are dark-brown to dark reddish-brown fine sandy loam to sandy loam. The B22ir and B3 horizons range from dark yellowish brown to reddish brown in color and from loamy fine sand to sand in texture. The B horizons are 3 to 12 percent fine gravel. The C horizons are layered sand and loamy fine sand and contain some fine gravel. Colors range from dark grayish brown to olive yellow. Reaction in the C horizons is medium acid to neutral, becoming less acid with depth.

Included with this soil in mapping are small areas where sand is lacking in the C horizons.

This soil is somewhat excessively drained. Permeability is moderately rapid. Roots penetrate to a depth of more than 60 inches. This soil holds 5 to 7 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Less than 20 percent of the acreage has been cleared and is used for growing pasture, hay, and home garden crops. Capability unit IVe-2; woodland group 4s2.

McMurray Series

The McMurray series consists of very poorly drained organic soils that formed in partly decomposed woody and fibrous remains of trees and water-tolerant grasses, reeds, sedges, and shrubs. These soils are underlain by mineral soil at a depth of 48 inches to 10 feet. They are in glacial basins or in ponded areas of displaced stream and river channels. Slopes range from 0 to 3 percent. Elevation ranges from slightly above sea level to about 1,000 feet. Annual precipitation is 20 to 60 inches. The average annual air temperature is 49° to 50°F. The above 32°F growing season ranges from 160 to 260 days, and the above 28°F growing

season ranges from 215 to 320 days. McMurray soils are associated mainly with Mukilteo soils.

In a representative profile the upper 6 inches of the soil is black mucky peat Below this, to a depth of 34 inches, is black mucky peat that is 10 to 20 percent partly decomposed fragments of wood mixed with fibrous plant remains. Both layers are slightly hard and brittle when dry. The next layer, to a depth of 72 inches, is dark reddish-brown mucky peat that is 10 to 25 percent partly decomposed woody fragments mixed with fibrous plant remains. The mineral soil has varied textures. All organic layers are neutral in reaction.

McMurray soils are mapped only in an undifferentiated group with Mukilteo soils

McMurray and Mukilteo peats (Mm).—This mapping unit consists of approximately 50 percent McMurray peat and 50 percent Mukilteo peat. These soils are in nearly level, shallow basins or depressions.

Representative profile of McMurray peat in an area of McMurray and Mukilteo peats, one mile north of Center, past the Port Ludlow Road intersection on the west side of the road, SW¼SW¼NE¼ sec 3, T. 28 N., R. 1 W.:

Oe1—0 to 6 inches, black (10YR 2/1) mucky peat (hemic material), black (5YR 2/1) dry and rubbed; slightly hard and brittle dry, many fine, medium, and coarse roots, neutral (pH 6 9), gradual, wavy boundary. (5 to 8 inches thick)

Oe2—6 to 34 inches, black (10YR 2/1) mucky peat (hemic material) that is 10 to 20 percent woody fragments, dark reddish-brown (5YR 3/2) dry and rubbed, slightly hard and brittle dry, common fine and medium roots, neutral (pH 6.8), gradual, wavy boundary. (24 to 36 inches thick)

Oe3—34 to 72 inches, dark reddish-brown (5YR 2/2) mucky peat (hemic material) that is 10 to 25 percent woody fragments, dark reddish brown (5YR 3/2) dry and rubbed; hard and very brittle dry; few fine roots to a depth of 54 inches, neutral (pH 6.7).

The depth to underlying mineral soil ranges from 52 inches to 10 feet or more. The mineral soil ranges from gravelly loamy sand to clay loam or clay Black to reddish-brown organic layers, each 6 to 40 inches thick, range from 3 to 5 in number They are 10 to 25 percent decomposing wood fragments In places thin layers of light-gray or light brownish-gray diatomaceous earth, 1 to 5 inches thick, are between the organic layers.

These soils are very poorly drained. Permeability is moderate. Roots can penetrate to a depth of more than 60 inches. These soils hold more than 10 inches of water available for plants. Runoff is very slow to ponded, and the hazard of water erosion is slight or nonexistent. A moderate hazard of sloughing or slumping exists along banks of open drainage ditches. A seasonal water table is at a depth of 0 to 12 inches. Capability unit IIw-2, not assigned to a woodland group.

Mukilteo Series

The Mukilteo series consists of very poorly drained organic soils that formed in partly decomposed plant remains, mainly reeds, sedges, and water-tolerant shrubs and grasses overlying mineral soil at a depth of 20 to 60 inches or more. These soils are in level to nearly level glacial basins or in ponded areas resulting from displaced stream and river channels. Elevation ranges from slightly above sea level to about 1,000 feet Annual precipitation is 20 to 100 inches or more. The average annual temperature ranges from 48°F to 50°F. The above 32°F growing season ranges from 180 to 210 days, and the above 28°F growing season ranges from 275 to 300 days. Mukilteo soils are associated mainly with McMurray soils.

In a representative profile 4 organic layers are present. The two upper layers, from the surface to a depth of 11 inches and below that to a depth of 24 inches, consist of dark reddish-brown peat and mucky peat. The third layer, to a depth of 50 inches, is dark reddish-brown mucky peat. The fourth layer, to a depth of 64 inches, is very dusky red mucky peat. All layers are 5 to 10 percent decomposing woody material. All organic layers are slightly acid Mineral soil material underlies the bottom layer.

Mukilteo soils, except for Mukilteo peat, moderately shallow variant, are mapped only in an undifferentiated group with McMurray soils.

Representative profile of Mukilteo peat in a virgin peat bog 0.4 mile northeast of Chevy Chase Inn, 100 yards west and 10 yards south in NW¼SE¼SW¼ corner sec. 29, T. 30 N., R. 1 W.:

Oe1—0 to 11 inches, dark reddish-brown (5YR 3/3) peat (fibrous material), black (5YR 2/1) dry and rubbed; spongy moist; slightly hard and brittle dry, many fine, medium, and coarse roots; slightly acid (pH 6 1), clear, wavy boundary. (9 to 13 inches thick)

Oe2—11 to 24 inches, dark reddish-brown (5YR 3/2) mucky peat (hemic material), black (5YR 2/1) dry and rubbed, slightly spongy moist; slightly hard and brittle dry, common fine and medium roots; slightly acid (pH 6.2); gradual, wavy boundary. (10 to 15 inches thick)

Oe3—24 to 50 inches, dark reddish-brown (2.5YR 2/4) mucky peat (hemic material), very dark brown (10YR 2/2) dry and rubbed, slightly spongy moist; slightly hard and brittle dry, few fine and medium roots; slightly acid (pH 6.3), gradual, wavy boundary. (21 to 31 inches thick)

Oe4—50 to 64 inches, dark reddish-brown (5YR 2/2) mucky peat (hemic material), very dark gray (5YR 3/1) dry and rubbed, soft and slippery wet; slightly hard and brittle dry, slightly acid (pH 6.4).

The depth to mineral soil material ranges from 55 to 120 inches or more. The mineral soil material ranges from gravelly loamy sand and sandy loam to silty clay loam and clay. Three to five organic layers are present Each ranges from 10 to 20 inches in thickness and from dark reddish brown to dusky red in color. In places layers 3 to 5 inches thick of light-gray or light brownish-gray diatomaceous earth and layers 6 to 14 inches thick of brown or grayish-brown diatomaceous earth are in between the organic layers. The upper two layers are strongly acid to slightly acid, and the lower layers are medium acid to slightly acid.

These soils are very poorly drained. Permeability is moderate. Roots penetrate to a depth of more than 60 inches. These soils hold more than 10 inches of water available for plants. Runoff is very slow to ponded, and the hazard of water erosion is slight or nonexistent. A seasonal high water table is at a depth of 0 to 12 inches.

Unless adequately drained, these soils are unsuitable for cultivation. They are used mainly for growing pasture, hay, and silage. They are also used extensively for growing truck and field crops. About 75 percent of the acreage of these soils is cleared. Undrained areas are used mainly for wildlife habitat and recreation areas.

Mukilteo peat, moderately shallow variant (Mu).—This soil is in basins or depressions. The upper 10 to 20 inches is very dusky red, fibrous sedge peat. Below this is a layer of dark reddish-brown, fibrous sedge peat, 12 to 30 inches thick. Beneath this layer are layers of mineral soil, mostly loam and sandy loam. The mineral soil material is at a depth of 24 to 36 inches in drained areas and at a depth of 30 to 48 inches in undrained areas

This soil is very poorly drained. Permeability is moderate in the upper part and rapid in the lower part. Roots penetrate to a depth of more than 60 inches. This soil holds more than 10 inches of water available for plants. Runoff is very

slow to ponded, and the hazard of water erosion is slight or nonexistent. A seasonal water table is at a depth of 0 to 12 inches.

This soil is used mainly for growing pasture and truck crops. Capability unit IIw-2; not assigned to a woodland group.

Olete Series

The Olete series consists of well-drained, very gravelly soils underlain by basalt bedrock at a depth of 20 to 30 inches. These soils are on rough, broken uplands Slopes range from 0 to 90 percent. Elevation ranges from slightly above sea level to about 1,000 feet. These soils formed in weathered basalt under Douglas-fir, western redcedar, red alder, madrone, rhododendron, and salal. Annual precipitation is about 28 to 32 inches. The average annual air temperature is 50°F. The above 32°F growing season ranges from about 190 to 230 days, and the above 28°F growing season ranges from about 200 to 260 days. These soils are associated with Ahl, Alderwood, Clallam, Everett, Grove, Hoodsport, and Triton soils.

In a representative profile the upper 3 inches of the soil is dark reddish-brown very gravelly silt loam. Below this, to a depth of 18 inches, is dusky-red very gravelly silt loam. Beneath this, and extending to a depth of 24 inches, is weak-red very stony silt loam that is 80 percent or more coarse basalt gravel and stones. This material is underlain by basalt bedrock, which is generally fractured. Rounded pebbles and angular basalt stones are scattered throughout these soils

Olete soils are almost entirely wooded, but a few acres are used for rural homesites.

Olete very gravelly silt loam, 0 to 30 percent slopes (OeD) —This nearly level to hilly soil is in areas of upland slopes. Most slopes range from 10 to 20 percent.

Representative profile 0 5 mile south of Knapp farm and 0.25 mile west of State Highway 9E; on logging road 150 yards southwest of basalt rock quarry in SW¼NE¼SW¼ sec. 19, T 28 N., R. 1 E.:

O1—2 inches to 1 inch, leaves, needles, and twigs.
O2—1 inch to 0, decomposed leaves, needles, and twigs.
B21ir—0 to 3 inches, dark reddish-brown (2.5YR 3/4) very gravelly silt loam, weak red (2.5YR 5/2) dry, moderate, very fine and fine, granular structure; hard, very friable, slightly sticky, nonplastic; many fine and medium roots, 55 percent angular pebbles; slightly acid; abrupt, wavy boundary. (2 to 6 inches thick)
B22ir—3 to 18 inches, dusky-red (2.5YR 3/2) very gravelly silt loam, pale red (2 5YR 6/2) dry, massive; hard, friable, slightly sticky, nonplastic, common fine roots; 65 percent angular pebbles; slightly acid, gradual, irregular boundary. (10 to 16 inches thick)
C—18 to 24 inches, weak-red (2.5YR 4/2) very stony silt loam, pale red (2 5YR 6/2) dry, massive; hard, friable, slightly sticky, nonplastic, 80 percent coarse fragments, slightly acid; clear, irregular boundary. (2 to 8 inches thick)
R—24 inches, basalt bedrock.

Depth to basalt bedrock ranges from 20 to 30 inches. The B horizons range from dark reddish brown to dusky red. Gravel and stones in the B horizons range from 50 to 80 percent. In the C horizon texture is silt loam or loam. This horizon is 75 to 90 percent coarse gravel and stones. Basalt stones and cobbles are in the A and B horizons in places.

Included with this soil in mapping are small areas of Rock outcrop and shallow soils.

This soil is well drained. Permeability is moderate. Roots penetrate to a depth of 20 to 30 inches. This soil holds about 2 to 4 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d2.

Olete very gravelly silt loam, 30 to 50 percent slopes (OeE).—This steep soil is on upland slopes in rough, broken country that has basalt outcrops and escarpments present in places.

Runoff is rapid, and the hazard of water erosion is severe. This soil is used for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d2.

Olete-Alderwood complex, 0 to 30 percent slopes (OlD).—This mapping unit is made up of about 60 percent Olete very gravelly silt loam, 0 to 30 percent slopes, and 40 percent Alderwood gravelly sandy loam, 0 to 15 percent slopes. The Olete soil is rolling to hilly, and the Alderwood soil is undulating to gently rolling.

The soils of this complex are used mostly for production of trees and for wildlife habitat and recreation areas. Small areas of the Alderwood soil are used as permanent and summer rural homesites and for growing pasture, hay, berries, fruit, and vegetables. Capability unit VIe-1; woodland group 3d2.

Olete-Clallam complex, 0 to 30 percent slopes (OmD).—This mapping unit is made up of about 60 percent Olete very gravelly silt loam, 0 to 30 percent slopes, and 40 percent Clallam gravelly sandy loam, 0 to 15 percent slopes. The Olete soil is rolling to hilly, and the Clallam soil is undulating to gently rolling.

The soils of this complex are used mostly for production of trees and for wildlife habitat and recreation areas. Small areas of the Clallam soils are used for permanent and summer rural homesites and for growing pasture, hay, vegetables, fruit, and berries Capability unit VIe-1; woodland group 3d2.

Olete-Hoodsport complex, 0 to 30 percent slopes (OpD).—This mapping unit is made up of about equal proportions of Olete very gravelly silt loam, 0 to 30 percent slopes, and Hoodsport very gravelly sandy loam, 0 to 15 percent slopes. The Olete soil is rolling to hilly, and the Hoodsport soil is undulating to gently rolling.

The soils of this complex are used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d2.

Olete-Rock outcrop complex, 50 to 90 percent slopes (OrF).—This mapping unit is made up of about 50 to 70 percent of an Olete very gravelly silt loam and 30 to 50 percent basalt stones and Rock outcrop.

Runoff is very rapid, and the hazard of water erosion is very severe. This complex is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIIs-1; woodland group 3d2.

Phelan Series

The Phelan series consists of moderately well drained, gravelly soils that have a very slowly permeable cemented layer at a depth of 10 to 20 inches. The soils formed in glacial till on stream and river valley side slopes in the western Olympic foothill areas. Slopes range from 30 to 80 percent. Elevation ranges from about 200 to 1,000 feet. Native vegeta-

tion consists of western hemlock, Sitka spruce, western redcedar, Pacific silver fir, red alder, vine maple, devils-club salmonberry, swordfern, and deerfern. Annual precipitation ranges from 110 to 165 inches. The average annual air temperature is 48° to 50°F. The above 32°F growing season ranges from 150 to 180 days, and the above 28°F growing season ranges from 190 to 220 days. These soils are associated with Hoko, Itswoot, and Klone soils.

In a representative profile in a wooded area, 2 inches of litter and humus cover the surface. The upper 11 inches of the soil is dark-brown gravelly silt loam. Below this, to a depth of 16 inches, is grayish-brown very gravelly silt loam. Beneath this layer is a cemented layer. Phelan soils are used mostly for production of trees and for wildlife habitat and recreation areas.

Phelan gravelly silt loam, 30 to 80 percent slopes (PHF).—This steep to very steep soil is along river valleys. Most slopes range between 40 and 65 percent.

Representative profile in the upper Hoh River Valley in the SE¼SW¼SW¼ sec. 29, T. 27 N., R. 11 W., 30 feet below rim of canyon where slope is 80 percent:

O1—2 inches to 1 inch, needles, leaves, twigs, bark, and moss.
O2—1 inch to 0, dark reddish-brown (5YR 2/2), decomposing forest litter, very strongly acid.
A1—0 to 2 inches, dark-brown (7.5YR 3/2) gravelly silt loam, brown (7.5YR 5/2) dry; moderate, very fine and fine, granular and moderate, fine and medium, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic, many fine, medium, and coarse roots; 40 percent medium and coarse gravel, very strongly acid, clear, wavy boundary. (1½ to 3 inches thick)
B21ir—2 to 4 inches, dark-brown (7.5YR 4/4) gravelly silt loam, light brown (7.5YR 6/4) dry, weak, very fine and fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; 40 percent medium and coarse gravel, very strongly acid, clear, wavy boundary. (1½ to 3 inches thick)
B22ir—4 to 11 inches, dark-brown (10YR 4/3) gravelly silt loam, pale brown (10YR 6/3) dry, weak, fine and medium, subangular blocky structure, slightly hard, friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; 45 percent coarse gravel and cobbles, very strongly acid; clear, wavy boundary. (5 to 8 inches thick)
B3—11 to 16 inches, grayish-brown (2 5Y 5/2) very gravelly silt loam, light gray (2 5Y 7/2) dry, many coarse, distinct, dark-brown (10YR 4/3) mottles; massive; hard, firm, slightly sticky, slightly plastic, common fine, medium, and coarse roots; 65 percent coarse gravel and cobbles, very strongly acid; gradual, wavy boundary. (3 to 6 inches thick)
C1sim—16 to 20 inches, gray (5Y 5/1) weakly cemented very gravelly silt loam, white (5Y 8/1) dry, common medium, prominent, strong-brown (7 5YR 5/6) mottles, massive, extremely hard, extremely firm, 60 percent coarse gravel and cobbles, very strongly acid, diffuse, smooth boundary. (3 to 10 inches thick)
C2—20 inches, very compact very gravelly silt loam glacial till. (Many feet thick)

The depth to the cemented layer ranges from 10 to 20 inches The A1, B21ir, and B22ir horizons are dark-brown to very dark grayish-brown gravelly loam or gravelly silt loam that is 15 to 45 percent gravel The B3 horizon is very gravelly loam or silt loam that is 55 to 75 percent gravel and cobbles. Depth to the cemented layer varies; it is 4 to 8 inches closer to the surface on the upper part of the slopes than it is on the lower part. The very compact, weakly cemented glacial till is 55 to 65 percent gravel and cobbles, most of which is gravel. Reaction ranges from very strongly acid to strongly acid throughout the profile.

This soil is moderately well drained. Permeability is moderate above the cemented layer. Roots penetrate to the cemented layer This soil holds 1 to 2 inches of water available for plants. Runoff is rapid to very rapid, and the hazards of land slip and water erosion are severe to very severe. A perched water table is on top of the cemented layer during the rainy season.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIIe-1; woodland group 4d1.

Queets Series

The Queets series consists of moderately well drained soils that formed on old river terraces in glaciofluvial sediments. They are mostly along the broad river valleys. Slopes range from 0 to 3 percent. Elevation ranges from 30 to 400 feet. Native vegetation consists mostly of western hemlock, Sitka spruce, red alder, maple, cottonwood, red elderberry, salmonberry, and swordfern. Annual precipitation ranges from 120 to 150 inches. The average annual air temperature is about 49°F. The above 32°F growing season is about 180 days, and the above 28°F growing season is about 210 days. These soils are associated mainly with Hoh, Huel, and Kalaloch soils.

In a representative profile in a wooded area, a thin layer of organic litter covers the surface. The upper 4 inches of the soil is very dark grayish-brown silt loam. Below this, to a depth of 39 inches, is dark-brown silt loam. Beneath this, and extending to a depth of 60 inches, is very dark grayish-brown fine sandy loam.

Queets soils are used mainly for production of trees and for wildlife habitat.

Queets silt loam (QT).—This nearly level soil is on old river terraces and gently sloping glacial outwash terraces. In most places slopes range from 2 to 3 percent.

Representative profile 150 yards south of Morrison Logging Company office in SW¼SE¼NW¼ sec. 18, T. 24 N., R. 12 W., 50 feet west of Clearwater River Road:

O1—3 inches to 1 inch, needles, leaves, fragments of wood, and moss.
O2—1 inch to 0, very dusky red (2.5YR 2/2) organic litter; very strongly acid.
A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate, fine and medium, granular structure, slightly hard, friable, slightly sticky, slightly plastic, many roots; strongly acid; clear, smooth boundary. (3 to 5 inches thick)
B21—4 to 8 inches, dark-brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak, coarse, prismatic structure that parts to weak, medium, subangular blocky; slightly hard, friable, slightly sticky, plastic, many roots, strongly acid, clear, wavy boundary. (3 to 6 inches thick)
B22—8 to 23 inches, dark-brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; common, medium, faint dark-brown (7.5YR 4/4) mottles and medium, prominent, greenish-gray (5GY 6/1) mottles; weak, coarse and medium, prismatic structure; hard, friable, slightly sticky, slightly plastic; few roots, strongly acid, gradual, wavy boundary. (12 to 18 inches thick)
B3—23 to 39 inches, dark-brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak, coarse, prismatic structure; hard, friable, slightly sticky, slightly plastic; few roots, strongly acid; clear, smooth boundary. (12 to 18 inches thick)
IIC—39 to 60 inches, very dark grayish-brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; massive; soft, very friable, nonsticky, nonplastic; medium acid.

The A horizon is very dark grayish-brown to dark-brown gravelly fine sandy loam to heavy silt loam. The B horizons range from dark brown to dark yellowish brown in color, from weak to moderate in structure, and from heavy silt loam to light silt loam in texture The C horizon is 5 to 10 percent river gravel. It is made up of layers of dark-brown, yellowish-brown, or very dark grayish-brown fine sandy loam, gravelly sandy loam, and loamy fine sand.

Included with this soil in mapping are small areas of sandy soils.

Figure 7.—**Ancient Douglas-fir growing on Queets silt loam.**

This soil is moderately well drained. Permeability is moderate. Roots penetrate to a depth of more than 60 inches. This soil holds about 10 inches of water available for plants. Runoff is slow to very slow, and the hazard of water erosion is slight A seasonal water table is at a depth of 3 to 5 feet, and the soil is subject to occasional overflow.

This soil is used mainly for production of trees (fig. 7) and for wildlife habitat, recreation areas, and rural homesites. It is better suited to farming, however, than most soils in western Jefferson County. Small areas are cleared and used for growing pasture and home garden crops. Capability unit IVw-2; woodland group 3o1.

Quilcene Series

The Quilcene series consists of moderately well drained soils underlain by weathered shale and sandstone bedrock at a depth of 20 to 40 inches. They are on uplands. Slopes range from 0 to 50 percent. Elevation ranges from slightly above sea level to about 800 feet. Native vegetation consists mostly of Douglas-fir, western redcedar, western hemlock, red alder, maple, salmonberry, red elderberry, huckleberry, salal, and swordfern. Annual precipitation ranges from 30 to 45 inches. The average annual air temperature is about 50°F. The above 32°F growing season ranges from 170 to 200 days, and the above 28°F growing season ranges from about 200 to 230 days. These soils are associated with Alderwood, Cathcart, Beausite, Everett, Indianola, Itswoot, Kitsap, and Sinclair soils.

In a representative profile in a wooded area, the upper 6 inches of the soil is dark grayish-brown silt loam. Below this, to a depth of 19 inches, is brown and yellowish-brown silty clay loam that has prominent, dark-red mottles and is 10 to 12 percent mixed glacial and shale gravel. The next layer, to a depth of 27 inches, is light olive-gray gravelly clay that has prominent, brown and dark-red mottles and is about 20 percent shale gravel. Beneath this layer is deeply weathered, massive, very firm shale that has prominent, dark-brown mottles. All soil layers are medium acid except the 11-to-19-inch layer, which is strongly acid.

Quilcene soils are used mainly for production of trees and for wildlife habitat, recreation areas, and rural homesites.

Quilcene silt loam, 0 to 15 percent slopes (QuC).—This nearly level to rolling soil is on uplands. Most slopes range from 6 to 12 percent.

Representative profile 150 yards east of the center of Quilcene Road, and 0.25 mile north of the Tarbee Lake Road in the SW¼NE¼ sec. 28, T. 29 N., R. 1 W.:

O1—2 inches to 1 inch, dark reddish-brown (5YR 2/2), loose, partly decomposed forest litter of needles, leaves, and twigs.

O2—1 inch to 0, black (5YR 2/1), decomposed forest litter, medium acid; abrupt, smooth boundary. (½ to 1 inch thick)

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam, pinkish gray (7.5YR 7/2) dry; moderate, fine, subangular blocky and moderate, coarse, granular structure, slightly hard, friable, sticky, plastic; many roots; 5 percent gravel; medium acid; clear, wavy boundary. (5 to 7 inches thick)

B21—6 to 11 inches, brown (10YR 5/3 and 7.5YR 5/4) silty clay loam, pinkish gray (7.5 7/2) dry; few fine, prominent, dark-red (2.5YR 3/6) mottles, moderate, very fine, subangular blocky structure, slightly hard, friable, sticky, plastic; common roots, 10 percent gravel; medium acid; gradual, wavy boundary. (4 to 8 inches thick)

B22—11 to 19 inches, yellowish-brown (10YR 5/4) silty clay loam, very pale brown (10YR 7/3) dry; few fine, prominent, dark-red (2.5YR 3/6) mottles and common, fine, distinct grayish-brown (2.5Y 5/2) mottles; moderate, fine, subangular blocky structure; slightly hard, firm, sticky, plastic; common roots; 12 percent mixed glacial and weathered shale gravel; strongly acid; gradual, wavy boundary. (7 to 10 inches thick)

B3—19 to 27 inches, light olive-gray (5Y 6/2) gravelly clay, white (2.5Y 8/2) dry; common, medium, prominent strong-brown (7.5YR 5/6) mottles and few, fine, prominent dark-red (2.5YR 3/6) mottles; moderate, medium, angular blocky structure; very hard, firm, sticky, plastic; few roots; 20 percent weathered angular shale gravel, medium acid; gradual, wavy boundary. (4 to 15 inches thick)

C—27 inches, light-gray (5Y 7/2) strongly weathered shale; common medium, prominent, dark-brown (7.5YR 4/4) mottles, massive, medium acid.

The A horizon ranges from dark grayish brown to reddish brown in color and from silt loam to silty clay loam in texture. The B21 and B22 horizons range from dark brown to yellowish brown in color and from silty clay loam to silty clay in texture. These horizons are 10 to 20 percent gravel. The B3 horizon is dark grayish-brown to light olive-gray clay, silty clay loam, or silty clay and is 20 to 30 percent weathered shale gravel. The depth to weathered shale is 20 to 40 inches.

Included with this soil in mapping are small areas of Alderwood and Kitsap soils.

This soil is moderately well drained. Permeability is slow. Roots penetrate to a depth of 20 to 40 inches. This soil holds about 4 to 7 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. A perched water table is on top of the shale during the rainy season.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Less than 20 percent of the acreage is under cultivation and is used for growing

pasture and home garden crops. Capability unit IIIe-1; woodland group 3d2.

Quilcene silt loam, 15 to 30 percent slopes (QuD).—This hilly soil is on uplands. On the upper part of the hillside, the soil is generally 20 to 26 inches deep to shale, and along the lower part it is 30 to 40 inches deep.

Runoff is medium to rapid, and the hazard of water erosion is moderate to severe. This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit IVe-3; woodland group 3d2.

Quilcene silt loam, 30 to 50 percent slopes (QuE).—This steep soil is on uplands. Along the upper part of the hillside, the soil is mostly 20 to 24 inches deep to weathered shale, and along the lower part it is 24 to 36 inches deep.

Runoff is rapid, and the hazard of water erosion is severe. This soil is used mainly for production of trees and for recreation areas and wildlife habitat. Capability unit VIe-1; woodland group 3d2.

Riverwash

Riverwash (Rh and RW) consists of a wide variety of coarse sand, gravel, cobbles, and sediment recently deposited by streams and rivers. This land type generally is in narrow, nearly level, broken strips along stream and river banks, bars, and flats. It also is along the banks of many old abandoned channels.

Riverwash is generally subject to frequent flooding. Its boundaries are constantly changing. The surface is nearly level to slightly undulating and is slightly higher than the normal level of the channel in which it occurs. In most places these deposits are many feet thick.

Recently deposited Riverwash is typically without vegetation. Older deposits have loamy or silty surface layers and support alder, willows, brush, grasses, and a few conifers.

These stream and riverwash materials are used mainly as a source of construction gravel, as channel-protection material, and as areas of wildlife habitat and recreation. Capability unit VIIIw-1; not assigned to woodland group.

Rock Land

Rock land (Rk) is made up of 50 to 70 percent outcrops of sandstone conglomerate, sandstone, and basalt. Between the outcrops are mainly Beausite and Alderwood gravelly sandy loams and very gravelly sandy loams. In some areas the soils between outcrops contain many more cobbles and stones than in other areas. Such soils have profiles similar to those described as representative of their respective series Slopes range from 50 to 90 percent.

Runoff is very rapid, and the hazard of water erosion is severe on adjacent soils, especially on clear-cut areas or areas where trees have been destroyed by fire. All of this land type is wooded. The dominant tree species are Douglas-fir and western hemlock.

This acreage is used for production of trees and for wildlife habitat and recreation areas. Capability unit VIIs-1; woodland group 4x2.

Rough Broken Land

Rough broken land (Ro and RY) consists of marine bluffs along the Pacific coastal strip of western Jefferson County and along Admiralty Inlet and Hood Canal in eastern Jefferson County. They are 80 feet or more high, about 100 feet or more wide, and have slopes of 50 to 120 percent. Slopes of less than 65 percent are generally covered with vegetation, and slopes of more than 65 percent are generally bare and subject to frequent landslips. Winter high tides and storms along these steeper bluffs frequently undermine their bases, causing land to slide down from above.

This land type is used mainly for wildlife habitat Capability unit VIIIe-1; not assigned to a woodland group.

San Juan Series

The San Juan series consists of somewhat excessively drained gravelly soils. Slopes range from 0 to 8 percent. Elevation ranges from slightly above sea level to about 300 feet. These soils formed in glacial outwash under native vegetation consisting mostly of annual perennial grasses, Oregon grape, salal, wild blackberry, bracken fern, and a scattering of Douglas-fir and white oak. Annual precipitation is 18 to 28 inches. The average annual air temperature is about 50°F. The above 32°F growing season ranges from about 230 to 270 days, and the above 28°F growing season ranges from 290 to 320 days. These soils are associated with Clallam, Dick, Everett, Townsend, and Whidbey soils.

In a representative profile the upper 17 inches of the soil is black gravelly sandy loam. Below this, to a depth of 22 inches, is dark reddish-brown gravelly loamy coarse sand. Beneath this, and extending to a depth of 60 inches, is dark-brown, grayish-brown, and very dark grayish-brown gravelly coarse sand. Glacial cobbles are present throughout the soil, particularly below a depth of 17 inches.

San Juan soils are used mostly for urban and rural homesites.

San Juan gravelly sandy loam, 0 to 8 percent slopes (SaB).—This nearly level to gently undulating soil is in areas of glacial drift and on outwash plains. Most slopes range from 3 to 6 percent.

Representative profile in Port Townsend, 0 2 mile north of San Juan grocery store on San Juan Avenue in NE¼NE¼ sec. 3, T. 30 N., R. 1 W., 10 feet west of road:

A11—0 to 4 inches, black (5YR 2/1) gravelly sandy loam, very dark brown (10YR 2/2) dry, moderate, medium, granular structure, soft, very friable, nonsticky, nonplastic; many fine roots, 20 percent fine and coarse gravel; medium acid, gradual, wavy boundary. (3 to 5 inches thick)

A12—4 to 17 inches, black (5YR 2/1) gravelly sandy loam, very dark brown (10YR 2/2) dry, moderate, medium and coarse, granular structure, soft, very friable, nonsticky, nonplastic, many fine roots; 22 percent fine and coarse gravel; medium acid, clear, wavy boundary. (8 to 14 inches thick)

AC—17 to 22 inches, dark reddish-brown (5YR 3/2) gravelly loamy coarse sand, dark brown (7 5YR 4/2) dry; single grained, loose, nonsticky, nonplastic; common fine roots; 35 percent mixed gravel and a few cobbles, slightly acid, gradual, wavy boundary. (4 to 6 inches thick)

C1—22 to 28 inches, dark-brown and grayish-brown (7 5YR and 2.5Y hues) gravelly coarse sand; single grained, loose, nonsticky, nonplastic, few fine roots, 40 percent mixed gravel and a few cobbles; slightly acid, gradual, wavy boundary. (5 to 7 inches thick)

C2—28 to 60 inches, very dark grayish-brown (2 5Y 3/2) gravelly coarse sand, grayish brown (2.5Y 5/2) dry, single grained; loose, nonsticky, nonplastic, 15 percent fine gravel; neutral.

The A horizons range from black to very dark brown. The AC horizon is dark reddish-brown to dark-brown coarse sandy loam and coarse loamy sand. This horizon is 15 to 45 percent gravel and cobbles. The C1 horizon is dark-brown, brown, or dark grayish-brown coarse sand and loamy coarse sand. It is 15 to 45 percent gravel and cobbles. The C2 horizon is very dark grayish-brown to

olive-brown coarse sand or medium sand and is 10 to 20 percent fine gravel.

Included with this soil in mapping are small areas of well-drained soils.

This soil is somewhat excessively drained. Permeability is rapid. Roots penetrate to a depth of more than 60 inches. This soil holds 3 to 4 inches of water available for plants. Runoff is slow, and the hazard of water erosion is slight.

Most of the acreage of this soil is in urban areas or in rural ranch areas where it is used extensively for growing a variety of flowers, bulbs, home garden fruits, berries, and vegetables. Small acreages are also planted to grasses and legumes used for hay and pasture. Capability unit VIs-1, woodland group 5f2.

Sekiu Series

The Sekiu series consists of poorly drained soils that formed in fine-textured alluvium and marine sediments. They are in glacial depressions and on glacial and marine terraces mostly slightly above sea level Slopes range from 0 to 5 percent. Elevation ranges from slightly above sea level to about 500 feet. Native vegetation consists mostly of western redcedar, western hemlock, Sitka spruce, skunkcabbage, rushes, salal, salmonberry, and swordfern. Annual precipitation ranges from 120 to 160 inches. The average annual air temperature is about 49° F. The above 32° F growing season is about 170 days, and the above 28° F growing season is about 210 days. These soils are associated with Calawah, Hoko, Kalaloch, Klone, and Tealwhit soils

In a representative profile in a wooded area, a 4-inch layer of partly decayed forest litter of leaves, needles, fragments of wood, and moss covers the surface. The upper 7 inches of the soil is dark reddish-brown clay. Below this, to a depth of 60 inches, is grayish-brown heavy clay that has strong-brown mottles.

Sekiu soils are used mainly for wildlife habitat and recreation areas.

Sekiu clay (SC).—This soil is in concave to nearly level depressions and on gently sloping glacial and marine terraces. Slopes are 0 to 5 percent.

Representative profile at Ocean Cliff along trail below Kalaloch Campground parking lot in SE¼NE¼SE¼ sec. 4, T. 24 N., R. 13 W.:

O—4 inches to 0, root mat.

A1—0 to 7 inches, dark reddish-brown (5YR 2/2) clay, dark reddish gray (5YR 4/2) dry; weak, coarse, prismatic structure that parts to weak, coarse, subangular blocky; very hard, very firm, sticky, plastic; common fine and medium roots, few soft manganese concretions; very strongly acid; clear, smooth boundary. (6 to 10 inches thick)

B21g—7 to 12 inches, grayish-brown (10YR 5/2) heavy clay, light gray (10YR 7/2) dry, few, fine, distinct yellowish-brown (10YR 5/6) mottles, weak, coarse, prismatic structure; extremely hard, extremely firm, sticky, very plastic; common fine roots; few manganese concretions, very strongly acid; clear, smooth boundary. (4 to 8 inches thick)

B22g—12 to 22 inches, grayish-brown (2.5Y 5/2) heavy clay, light gray (2.5Y 7/2) dry; many, fine, prominent strong-brown (7.5YR 5/8) mottles; faces of prisms are dark reddish brown (5YR 2/2), weak, coarse, prismatic structure; extremely hard, extremely firm, sticky, very plastic; few roots, along faces of prisms only, few fine iron-manganese concretions; very strongly acid, gradual, smooth boundary. (8 to 12 inches thick)

B3g—22 to 60 inches, grayish-brown (2.5Y 5/2) heavy clay, light gray (2 5Y 7/2) dry; many, fine, prominent strong-brown (7.5Y 5/8) mottles, faces of prisms dark reddish brown (5YR 3/3), weak, coarse, prismatic structure; extremely hard, firm, sticky, plastic; few fine roots along faces of prisms, few fine iron-manganese concretions, very strongly acid.

The A horizon is black, dark reddish brown, or very dark gray. The B horizons are grayish-brown to dark grayish-brown heavy clay or silty clay. The profile ranges from very strongly acid to strongly acid

This soil is poorly drained. Permeability is very slow. Roots penetrate to a depth of about 36 to 48 inches. This soil holds 7 to 8 inches of water available for plants. Runoff is very slow to ponded, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 6 to 12 inches.

This soil is used mainly for wildlife habitat and campsites. In places it has been drained and covered with several feet of gravelly sandy loam material and then used for campsites. Trees grow slowly on this soil and have little commercial value. Capability unit VIw-1; not assigned to a woodland group.

Semiahmoo Series

The Semiahmoo series consists of very poorly drained organic soils that formed in well decomposed and disintegrated plant remains and overlying mineral soil material at a depth of 52 to 60 inches or more. These soils are in glacial basins or old displaced stream and river channel ponded areas. Slopes range from 0 to 2 percent. Elevation ranges from near sea level to about 1,000 feet. Annual precipitation is 20 to 60 inches. The average annual air temperature is 49 to 50° F. The above 32° F growing season ranges from 160 to 260 days, and the above 28° F growing season ranges from 215 to 320 days. These soils are associated mainly with McMurray and Mukilteo soils.

In a representative profile the upper 12 inches of the soil is black muck containing many fine roots and a few decomposing fragments of wood. Below this, to a depth of 16 inches, is dark reddish-brown muck that is about 25 percent identifiable sedge fibers (before rubbing) and contains many fine roots. Beneath this, and extending to a depth of 25 inches, is brown mucky peat that darkens to dark reddish-brown when exposed to air. The next layer, to a depth of 54 inches, is brown mucky peat that darkens rapidly to dark reddish brown when exposed to air. Below this is a 1-inch layer of light-gray very fine sand and silt volcanic ash. Below this, to a depth of 55 inches, is dark reddish-brown muck. The organic layers are neutral to medium acid.

About 70 to 80 percent of the acreage of Semiahmoo soils is under cultivation Most of the rest is in pasture.

Semiahmoo muck (Se).—This nearly level soil is in valley basins.

Representative profile 1.5 miles southeast of Chimacum in SW¼NW¼NW¼ sec. 24, T. 29 N., R. 1 W.:

Oa1—0 to 12 inches, black (5YR 2/1) muck (sapric material), dark reddish brown (5YR 3/2) dry, moderate, very fine, fine, and medium, granular structure; hard, firm, nonsticky, nonplastic; many roots on surfaces of peds, few fragments of wood; slightly acid (pH 6/2), gradual, wavy boundary (8 to 14 inches thick)

Oa2—12 to 16 inches, dark reddish-brown (5YR 2/2) muck (sapric material), dark reddish brown (5YR 3/2) dry; weak, fine and medium, granular structure; hard, firm, nonsticky, nonplastic; about 25 percent sedge fibers that can be identified before rubbing, common roots on surfaces of peds, slightly acid (pH 6.2), gradual, wavy boundary. (2 to 6 inches thick)

Oa3—16 to 25 inches, brown (7 5YR 4/4) mucky peat (sapric material), that darkens to dark reddish brown (5YR 2/2) upon exposure to air, reddish brown (5YR 4/4) dry; weak, fine, granular structure, slightly hard, friable, nonsticky, nonplastic;

about 50 percent of mass that, before rubbing, can be identified as leaves and stems of sedges and reeds, slightly acid (pH 6.2); gradual, wavy boundary. (7 to 12 inches thick)

Oa4—25 to 54 inches, brown (7.5YR 4/4) mucky peat (sapric material) that darkens rapidly to dark reddish brown (5YR 3/3 and 5YR 2/2) upon exposure to air, dark reddish brown (5YR 3/3) dry, fibrous and massive, finely divided; slightly hard, very friable, nonsticky, nonplastic, about 25 percent leaves and stems that can be identified before rubbing, medium acid (pH 6.0), abrupt, wavy boundary. (20 to 40 inches thick)

IIC—54 to 55 inches, light-gray (10YR 7/1) very fine sand and silt volcanic ash, light gray (10YR 7/1) dry; massive; soft, very friable, nonsticky, nonplastic; medium acid (pH 6.0); abrupt, wavy boundary. (½ to 2 inches thick)

Oa5—55 to 60 inches, dark reddish-brown (5YR 3/4) muck (sapric material) that darkens rapidly, upon exposure to air, to dark reddish brown (5YR 2/2) and finally to black (5YR 2/1), black (5YR 2/1) dry, massive, hard, very friable, nonsticky, nonplastic, less than 15 percent wood fibers can be identified, neutral (pH 6 6).

In places ½- to 2-inch strata (or a single stratum) of volcanic ash or a 1- to 12-inch layer of light-gray or light brownish-gray diatomaceous earth are present at any depth in the profile The organic layers range from medium acid to neutral.

This soil is very poorly drained. Permeability is moderate. Roots penetrate to a depth of 60 inches. This soil holds more than 10 inches of water available for plants. Runoff is very slow or ponded, and the hazard of erosion is generally slight or nonexistent. Along banks of open drainage ditches, however, sloughing and slippage are common. A seasonal high water table is at a depth of 0 to 1 foot.

This soil is used mainly for growing grasses and legumes for hay, silage, and grazing and for growing garden truck and field crops. Capability unit IIw-2; not assigned to a woodland group.

Semiahmoo muck, moderately shallow variant (Sh).—This soil has a surface layer of black muck 10 to 15 inches thick, and in most places two to four layers of muck and mucky peat are above the mineral soil material. A layer of diatomaceous earth, 2 to 5 inches thick, is generally 10 to 18 inches below the surface. In many places the mucky peat layer near the bottom is 25 to 40 percent silt and clay. The depth to the underlying mineral soil material, which includes loamy sand, sandy loam, sandy clay loam, sandy clay, and clay, ranges from 24 to 48 inches.

This soil is used mainly for growing grasses and legumes for livestock and for garden truck and field crops. Capability unit IIw-2; not assigned to a woodland group.

Semiahmoo muck, shallow variant (Sm).—In this soil the organic material is 15 to 24 inches thick over mineral soil material which includes loamy sand, sandy loam, sandy clay loam, sandy clay, and clay.

The soil is used mainly for growing grasses, legumes, and truck and field crops. Capability unit IIw-2; not assigned to a woodland group.

Sinclair Series

The Sinclair series consists of moderately well drained soils that have a very slowly permeable cemented layer at a depth of 20 to 40 inches. These soils formed in glacial till on glacial terraces. Slopes range from 0 to 30 percent. Elevation ranges from 100 to 800 feet. Vegetation is mainly Douglas-fir, western redcedar, red alder, willow, rhododendron, and salal. Annual precipitation ranges from 25 to 45 inches. The average annual air temperature is 49° F. The above 32° F growing season ranges from 180 to 210 days, and the above 28° F growing season ranges from 210 to 240 days. These soils are associated with Alderwood, Cathcart, Beausite, Everett, Hoypus, Indianola, Kitsap, Olete, Quilcene, and Whidbey soils.

In a representative profile in a wooded area, the upper 2 inches of the soil is grayish-brown fine sandy loam. Below this, to a depth of 8 inches, is dark-brown gravelly sandy loam. Beneath this, and extending to a depth of 25 inches, is dark-brown and dark yellowish-brown gravelly sandy loam. Below a depth of 25 inches is a dark grayish-brown cemented layer. Glacial cobbles and stones are present throughout the profile.

Most of the acreage of this soil is used for production of trees, and most areas are wooded. Less than 20 percent of the acreage has been cleared and is used for small ranches and rural homesites Some pasture, hay, berries, and vegetables are grown in cleared areas for personal use.

Sinclair gravelly sandy loam, 0 to 15 percent slopes (SnC).—This nearly level to rolling soil is on glacial terraces. Most slopes range from 5 to 10 percent.

Representative profile in SE¼NE¼NW¼ sec. 15, T. 28 N., R. 1 W.:

O1—2¾ inches to ¾ inch, needles, leaves, bark, and fragments of wood

O2—¾ inch to 0, black (5YR 2/1), partly decayed needles, leaves, bark, and fragments of wood; strongly acid, abrupt, wavy boundary. (½ to 1½ inches thick)

A1—0 to 2 inches, grayish-brown (10YR 5/2) fine sandy loam, gray (10YR 6/1) dry, weak, very fine and fine, granular structure, soft, very friable, nonsticky, nonplastic; many fine and medium roots, medium acid; abrupt, wavy boundary. (1 to 3 inches thick)

B21ir—2 to 8 inches, dark-brown (7.5YR 4/2) gravelly sandy loam, pinkish gray (7.5YR 6/2) dry; weak, fine, granular structure, soft, friable, nonsticky, nonplastic, many fine and medium roots, common hard iron-manganese concretions; medium acid; clear, wavy boundary. (4 to 6 inches thick)

B22ir—8 to 18 inches, dark-brown (7.5YR 4/4) gravelly sandy loam, pale brown (10YR 6/3) dry; weak, very fine and fine, subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; many fine and medium roots; common hard iron-manganese concretions; medium acid, clear, wavy boundary. (8 to 10 inches thick)

B3—18 to 25 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam, pale brown (10YR 6/3) dry; moderate, medium, subangular blocky structure, slightly hard, firm, slightly sticky, slightly plastic, common fine and medium roots, medium acid; clear, wavy boundary. (7 to 21 inches thick)

C1sim—25 to 48 inches, dark grayish-brown (10YR 4/2), weakly cemented gravelly loamy sand, light brownish gray (2.5Y 6/2) dry; common, fine, prominent dark-brown (7.5YR 4/4) mottles, massive, extremely hard, extremely firm, medium acid, diffuse, smooth boundary. (20 to 30 inches thick)

C2—48 inches, very compact gravelly loamy sand glacial till. (Many feet thick)

Depth to the cemented layer ranges from 20 to 40 inches The A horizons range from grayish brown to dark brown. The B horizons range from dark brown to dark yellowish brown. The Csm horizon is gray, dark grayish brown, or dark olive gray. Reaction ranges from strongly acid to medium acid throughout the profile.

Included with this soil in mapping are small areas of Olete and Kitsap soils.

This soil is moderately well drained Permeability is moderately rapid above the cemented layer. Roots penetrate to the cemented layer. This soil holds about 2 to 4 inches of water available for plants Runoff is slow to medium, and the hazard of water erosion is slight to moderate. A perched water table is on top of the cemented layer during the rainy season.

This soil is used mainly for production of trees and for wildlife habitat, recreation areas, and rural homesites. Less than 15 percent of the acreage is used for growing pasture,

hay, and home garden crops. Capability unit IVe-1; woodland group 4d2.

Sinclair gravelly sandy loam, 15 to 30 percent slopes (SnD).—This hilly soil is on glacial terraces adjacent to steep drainageways and canyons. Along the top half of slopes, the soil is generally 20 to 24 inches deep to the cemented layer. Along the bottom half this depth is 24 to 40 inches.

Runoff is medium to rapid, and the hazard of water erosion is moderate to severe. This soil is used mainly for production of trees, for urban development, and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 4d2.

Snahopish Series

The Snahopish series consists of well-drained soils that formed in shale and fine-grained sandstone on mountain foothills. Slopes range from 0 to 30 percent. Elevation ranges from 200 to 2,500 feet. Native vegetation consists mainly of western hemlock, western redcedar, Sitka spruce, Pacific silver fir, vine maple, huckleberry, salmonberry, swordfern, and deerfern. Annual precipitation ranges from 110 to 170 inches. The average annual air temperature is 47° to 49° F. The above 32° F growing season ranges from 140 to 180 days, and the above 28° F growing season ranges from 200 to 240 days. These soils are associated with Calawah, Hoko, Itswoot, Klone, Solleks, and Tealwhit soils.

In a representative profile a 4-inch layer of forest litter covers the surface. The upper 5 inches of the soil is dark reddish-brown silty clay loam. Below this, to a depth of 10 inches, is dark-brown heavy silty clay loam. Beneath this, and extending to a depth of 30 inches, is strong-brown gravelly silty clay loam. The next layer, to a depth of 40 inches, is strong-brown very gravelly silty clay loam Beneath this layer is yellowish-brown very gravelly silty clay loam that extends to a depth of 60 inches.

This soil is used for production of trees and for wildlife habitat and recreation areas.

Snahopish silty clay loam, 0 to 30 percent slopes (SPD).—This nearly level to moderately steep soil is on hilly mountain foothills. In most places slopes range from 15 to 25 percent, but on ridgetops they average 5 to 10 percent.

Representative profile 1 3 miles west of the Clearwater River Bridge on Rayonier Company spur road No. 1310, in NW¼SW¼SW¼ sec. 13, T 24 N., R. 13 W., 10 feet north of road on sidehill:

O1—4 inches to 2 inches, needles, leaves, twigs, fragments of wood, and a mat of fine and medium roots

O2 -2 inches to 0, dark reddish-brown (5TR 2/2) organic litter, very strongly acid, abrupt, wavy boundary.

A1—0 to 5 inches, dark reddish-brown (5YR 3/2) silty clay loam, reddish gray (5YR 5/2) dry; moderate, medium and coarse, granular and weak, medium, subangular blocky structure; hard, friable, slightly sticky, plastic; many fine, medium, and coarse roots, thick organic outans on some faces of peds and in wormholes, 10 percent fine, angular pebbles; very strongly acid, clear, smooth boundary. (3 to 6 inches thick)

B21—5 to 10 inches, dark-brown (7.5YR 4/4) heavy silty clay loam, light brown (7.5YR 6/4) dry, moderate, fine and very fine, subangular blocky structure; hard, friable, slightly sticky, plastic; many fine, medium, and coarse roots, 12 percent fine, angular pebbles, very strongly acid, gradual, wavy boundary. (4 to 8 inches thick)

B22—10 to 30 inches, strong-brown (7.5YR 5/6) gravelly heavy clay loam, pink (7.5YR 7/4) dry, moderate, fine and very fine, subangular blocky structure, very hard, friable, sticky, plastic, common fine and medium roots; 25 percent fine, angular pebbles, strongly acid; gradual, irregular boundary. (17 to 24 inches thick)

C1—30 to 40 inches, strong-brown (7.5YR 5/8) very gravelly silty clay loam, reddish yellow (7.5YR 7/8) dry; weak, coarse and medium, blocky structure, very hard, firm, sticky, plastic; few fine roots, 50 percent fine and coarse, angular pebbles, strongly acid; gradual, irregular boundary. (8 to 12 inches thick)

C2—40 to 60 inches, yellowish-brown (10YR 5/4) very gravelly silty clay loam, very pale brown (10YR 7/4) dry, massive, very hard, firm, sticky, slightly plastic, few fine roots; few fine and medium pores, about 90 percent coarse, angular pebbles; strongly acid

The A horizon ranges from dark reddish brown to dark brown and is 5 to 25 percent gravel. The B2 horizons are dark brown, strong brown, dark yellowish brown, or yellowish brown. The B21 horizon is 10 to 20 percent gravel, and the B22 horizon is 25 to 50 percent gravel. The C horizons are very flaggy to very gravelly silty clay loam and are 50 to 90 percent weathered sandstone and shale fragments. The C horizons are underlain by consolidated bedrock at a depth of 40 to 60 inches or more. Reaction ranges from very strongly acid to medium acid throughout the profile

This soil is well drained. Permeability is moderately slow. Roots penetrate to a depth of 60 inches or to bedrock if it is above a depth of 60 inches. This soil holds about 6 to 8 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3o1.

Snohomish Series

The Snohomish series consists of poorly drained soils that formed in alluvium in stream valleys. They contain a layer of peat and muck at a depth of 17 to 20 inches. Slopes range from 0 to 2 percent. Elevation ranges from 50 to 300 feet. Native vegetation consists mostly of water-tolerant grasses, brush, sedges, alder, willow, maple, western redcedar, and western hemlock. Annual precipitation is 22 to 50 inches. The average annual air temperature is 50° F. The above 32° F growing season is about 260 days, and the above 28° F growing season is about 320 days. These soils are associated mainly with Belfast, McMurray, Mukilteo, Semiahmoo, Tisch, and Wapato soils.

In a representative profile the upper 5 inches of the soil is very dark grayish-brown silty clay loam. Below this, to a depth of 17 inches, is gray silty clay. Beneath this, and extending to a depth of 28 inches, is dark reddish-brown sedimentary, woody, and sedge peat. The next layer, to a depth of 39 inches, is dark reddish-brown, fibrous sedge peat. Below this, to a depth of 52 inches, is dark yellowish-brown, fibrous peat and muck. The soil is slightly acid to medium acid.

Snohomish soils are used for growing garden and vegetable crops and pasture and for wildlife habitat and recreation areas.

Snohomish silty clay loam (So).—This nearly level soil is in stream valleys, generally in close association with peat and muck soils. Slopes range from 0 to 2 percent.

Representative profile in SW¼SW¼ sec. 25, T. 28 N., R 2 W., southeast of Lake Leland and 100 yards southwest of Larnon Munn farm·

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate, fine, subangular blocky structure that parts to moderate, medium, granular, hard, friable, slightly sticky, plastic; many fine roots; medium acid, clear, smooth boundary. (4 to 6 inches thick)

Figure 8.—**Pasture on Snohomish silty clay loam. Alderwood gravelly sandy loam is in the background.**

B21g —5 to 12 inches, gray (10YR 5/1) silty clay, light gray (10YR 7/1) dry; moderate, coarse, subangular blocky structure, very hard, firm, very sticky, very plastic, common fine roots, slightly acid, gradual, wavy boundary. (6 to 12 inches thick)

B22g—12 to 17 inches, gray (10YR 5/1) silty clay, light gray (10YR 7/1) dry, moderate, medium, prismatic structure, very hard, firm, very sticky, very plastic; few fine roots; slightly acid, clear, smooth boundary. (5 to 12 inches thick)

IIOe1—17 to 28 inches, dark reddish-brown (5YR 2/2) sedimentary, woody, and sedge peat, dark brown (7.5YR 3/2) dry, mixed fibrous, woody, and weak, fine, granular structure; slightly hard, friable, nonsticky, nonplastic; medium acid; gradual, wavy boundary. (9 to 12 inches thick)

IIOe2—28 to 39 inches, dark reddish-brown (5YR 2/2), fibrous sedge peat, very dark brown (10YR 2/2) dry; massive, slightly hard, very friable, nonsticky, nonplastic, medium acid; gradual, wavy boundary. (9 to 12 inches thick)

IIOe3—39 to 60 inches, dark yellowish-brown (10YR 4/4), fibrous peat and muck, very dark grayish brown (2.5Y 3/2) dry, massive, slightly hard, very friable, nonsticky, nonplastic, about 20 percent fibrous peat and 80 percent muck, medium acid (pH 5.8).

The A horizon ranges from very dark gray to dark grayish brown, and is silt loam, silty clay loam, and silty clay. The B horizons are very dark gray to light olive-gray heavy silty clay loam to silty clay. The organic horizons are dominantly dark reddish brown and consist of heterogeneous stratified layers of sedimentary, woody, and sedge peat in various stages of decomposition. In places mineral material underlies the organic horizons at a depth of about 48 inches.

This soil is poorly drained. Permeability is slow. Roots penetrate to a depth of 60 inches. This soil holds more than 10 inches of water available for plants. Runoff is very slow, and the hazard of water erosion is slight or nonexistent. A seasonal high water table is at a depth of 0 to 12 inches.

Most of the acreage of this soil is cleared and used for growing pasture (fig. 8) or home garden, berry, and vegetable crops. About 30 to 40 percent of the acreage is wooded and is used mostly for wildlife habitat and recreation areas. Capability unit IIw-2; not assigned to a woodland group.

Solleks Series

The Solleks series consists of well-drained, very channery soils that are underlain by bedrock at a depth of 40 to 50 inches. These soils formed in weathered fine-grained sandstone, shale, graywacke, and other bedrock material (fig. 9). Solleks soils are in rough, broken mountainous areas. Slopes range from 30 to 50 percent. Elevation ranges from 800 to 3,400 feet. Native vegetation consists mostly of western hemlock, Pacific silver fir, western redcedar, mountain hemlock, vine maple, huckleberry, salmonberry, swordfern, and deerfern. Annual precipitation ranges from 140 to 180 inches. The average annual air temperature is 46° to 49° F. The above 32° F growing season is 130 to 140 days, and the above 28° F growing season is about 220 days. These soils are associated with Dimal, Hoko, Itswoot, Klone, and Snahopish soils.

In a representative profile 2 inches of forest litter and humus cover the surface. The upper 17 inches of the soil is dark reddish-brown channery and dark-brown very channery silty clay loam. Below this, to a depth of 30 inches, is dark-brown very channery silty clay loam. Beneath this, and extending to a depth of 42 inches, is dark-brown very channery silty clay loam that is 70 percent coarse fragments. This material is underlain by shale bedrock.

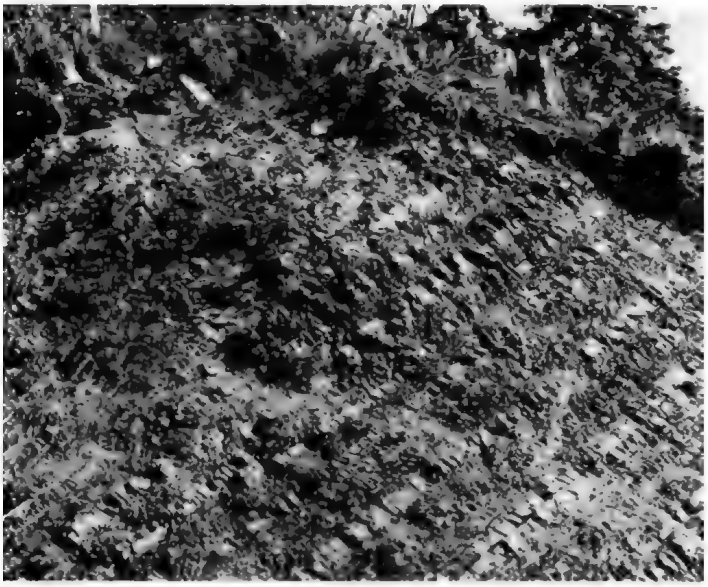

Figure 9.—**Tilted stratified shale and sandstone. Solleks soils formed in material weathered from this bedrock.**

This soil is used for production of trees and for wildlife habitat and recreation areas.

Solleks channery silty clay loam, 30 to 50 percent slopes (SSE).—This steep soil is on rough, broken mountain foothills In most places slopes range from 40 to 50 percent.

Representative profile in NW¼SW¼SW¼ sec. 12, T. 26 N., R. 11 W., 1.8 miles up the Maple Creek Road:

O1—2 inches to 1 inch, needles, bark, fragments of wood, and moss.
O2—1 inch to 0, black (5YR 2/1), partly decomposed needles, bark, fragments of wood, and moss, dark gray (5YR 4/1) dry, very strongly acid, abrupt, wavy boundary. (1 to 2 inches thick)
A1—0 to 5 inches, dark reddish-brown (5YR 3/2) channery silty clay loam, reddish gray (5YR 5/2) dry; moderate, fine and medium, granular structure; slightly hard, friable, nonsticky, slightly plastic; many fine, medium, and coarse roots; 35 percent coarse fragments; very strongly acid, gradual, wavy boundary. (2 to 6 inches thick)
A3—5 to 17 inches, dark-brown (7 5YR 3/2) very channery silty clay loam, brown (7.5YR 5/2) dry; moderate, fine and medium, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic, many fine, medium, and coarse roots; 55 percent coarse fragments; strongly acid; gradual, wavy boundary. (5 to 12 inches thick)
B2—17 to 30 inches, dark-brown (7 5YR 4/4) very channery silty clay loam, light yellowish brown (10YR 6/4) dry; moderate, medium and coarse, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic, few fine and medium roots; 55 percent coarse fragments; medium acid; clear, wavy boundary. (8 to 18 inches thick)
C—30 to 42 inches, dark-brown (7 5YR 4/4) very channery silty clay loam, light yellowish brown (10YR 6/4) dry; massive, slightly hard, friable, slightly sticky, slightly plastic; few fine roots, 70 percent coarse fragments; medium acid, abrupt, wavy boundary. (10 to 12 inches thick)
R—42 inches, dark-brown, fractured shale bedrock; massive; strongly acid.

The A1 horizon is 30 to 50 percent flat rock fragments up to 6 inches in length Most areas are flaggy or channery at elevations above 1,200 to 1,500 feet and gravelly at the lower elevations. The B2 horizon is dark-brown, strong-brown, brown, and yellowish-brown silty clay loam and clay loam Flat rock fragments and coarse gravel increase with depth, ranging from 50 percent in the A3 horizon to 70 percent in the C horizon.

Included with this soil in mapping are small areas where slopes are 50 to 90 percent and areas where texture is silt loam. As much as 35 percent of some mapped areas consist of soils that are 30 to 40 inches deep over shale.

This soil is well drained. Permeability is moderate. Roots penetrate to a depth of 40 to 50 inches. This soil holds about 3 to 5 inches of water available for plants. Runoff is rapid, and the hazard of water erosion is severe.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 2f1.

Solleks-Hoko association, steep (SVE).—This association is made up of about 60 percent Solleks channery silty clay loam, 30 to 50 percent slopes, and 40 percent Hoko gravelly silt loam, 30 to 50 percent slopes. Most of the Solleks soil in this association has 40 to 50 percent slopes, and the Hoko soil has 30 to 40 percent slopes. The association is in glaciated areas below elevations of 1,000 to 1,200 feet. Runoff is rapid, and the hazard of landslip is moderate. The hazard of water erosion is severe.

This association is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 3d1.

Swantown Series

The Swantown series consists of somewhat poorly drained, gravelly soils that have a very slowly permeable cemented layer at a depth of 18 to 24 inches. They are on uplands. Slopes range from 0 to 8 percent. Elevation ranges from near sea level to about 600 feet. These soils formed in glacial till under a forest cover of dominantly Douglas-fir, western redcedar, bigleaf maple, red alder, and willow. Annual precipitation is 25 to 35 inches The average annual air temperature is 50° F. The above 32° F growing season ranges from 200 to 250 days, and the above 28° F growing season ranges from about 250 to 300 days These soils are associated mainly with Alderwood, Belfast, Clallam, Everett, and Sinclair soils.

In a representative profile in a wooded area, a thin layer of organic litter covers the surface. The upper 5 inches of the soil is very dark grayish-brown gravelly sandy loam. Below this, to a depth of 13 inches, is brown gravelly sandy loam. Beneath this, and extending to a depth of 22 inches, is gray gravelly sandy loam. This material is underlain by a cemented layer that formed in very compact glacial till. Reaction is strongly acid to medium acid throughout the profile.

Swantown soils are used mainly for production of trees and for wildlife habitat.

Swantown gravelly sandy loam, 0 to 8 percent slopes (StB).—This nearly level to gently sloping soil is in lowland seep spots of terraces along the toeslopes of moderately steep, hilly glacial terraces

Representative profile 120 yards east of West Chimicum Valley Road in NE¼NW¼NE¼ sec. 27, T. 29 N., R. 1 W.:

O1—3 inches to 1 inch, leaves, needles, and twigs.
O2—1 inch to 0, dark reddish-brown (5YR 2/2), decomposed leaves, needles, and twigs, very strongly acid.
A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) gravelly sandy loam, grayish brown (10YR 5/2) dry, moderate, fine and medium, granular structure; soft, very fine, friable, nonsticky, nonplastic; many fine, medium, and coarse roots; 35 percent gravel; strongly acid, clear, smooth boundary. (4 to 6 inches thick)
B2—5 to 13 inches, brown (10YR 5/3) gravelly sandy loam, very pale brown (10YR 7/3) dry; common medium, distinct, strong-brown (7.5YR 5/6) mottles, weak, medium and coarse, sub-

angular blocky structure; slightly hard, firm, nonsticky, nonplastic; many fine and medium roots, 35 percent gravel; many iron-manganese concretions, strongly acid; gradual, wavy boundary. (7 to 12 inches thick)

CI—13 to 22 inches, gray (10YR 5/1) gravelly sandy loam, light gray (10YR 7/1) dry; common medium, distinct, yellowish-brown (10YR 5/6) and yellowish-red (5YR 5/6) mottles; massive, compacted; hard, very firm, nonsticky, nonplastic, common fine and medium roots, root mat at the base of horizon, 40 percent gravel; medium acid; gradual, wavy boundary. (10 to 12 inches thick)

C2sim—22 to 32 inches, gray (10YR 5/1), weakly cemented very gravelly sandy loam, light gray (10YR 7/1) dry, common medium, distinct, brown (10YR 5/3) mottles; massive; extremely hard, extremely firm, 60 percent gravel; medium acid. (9 to 15 inches thick)

C3—32 inches, very compact very gravelly sandy loam glacial till. (Many feet thick)

The depth to the cemented layer is 20 to 30 inches. The A horizon ranges from dark brown to very dark grayish brown in color. The B horizon ranges from brown to dark brown and dark yellowish brown.

Included with this soil in mapping are small areas where the cemented layer is at a depth of less than 20 inches.

This soil is somewhat poorly drained Permeability is moderately rapid above the cemented layer and very slow in the cemented layer. Roots penetrate to the cemented layer. This soil holds about 2 to 4 inches of water available for plants. Runoff is slow, and the hazard of water erosion is slight. A perched water table is at a depth of ½ to 1 foot during the rainy season.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Cleared areas are used for hay and pasture crops. Capability unit IVw-1; woodland group 4w2.

Swantown gravelly loam, 0 to 8 percent slopes (SuB).—This soil has a surface layer of very dark gray and very dark grayish-brown gravelly loam 10 to 14 inches thick and a subsoil of dark-gray to dark grayish-brown gravelly loam that has grayish-brown mottles. Below this, is a cemented layer The soil is medium to slightly acid throughout.

Included with this soil in mapping are small areas of soils that have a surface layer 7 to 10 inches thick and a cemented layer at a depth of 16 to 20 inches.

Permeability above the cemented layer is moderate. About half the acreage of this soil is wooded. The other half has been cleared and is used for pasture and home garden vegetable crops. In some areas this soil is used for rural summer homesites. The most important uses for this soil are production of trees, wildlife habitat, and recreation areas. Capability unit IVw-1; woodland group 4w2.

Swantown-Alderwood complex, 0 to 15 percent slopes (SwC) —This mapping unit is made up of about 60 percent Swantown gravelly loam, 0 to 8 percent slopes, and 40 percent Alderwood gravelly loam, 0 to 15 percent slopes. It is on nearly level to rolling upland glacial terraces.

Included with this soil in mapping are small areas of Belfast silty clay loam, wet variant.

The soils of this complex are used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit IVw-1; woodland group 4w2.

Tealwhit Series

This series consists of poorly drained soils that formed in fine glacial and alluvial sediments. They are on upland depressions and along wide stream or river bottoms, either along seepy areas at the base of rolling or steep uplands or in old channels filled with sediment. Slopes range from 0 to 8 percent. Elevation ranges from slightly above sea level to about 2,000 feet. Native vegetation consists mostly of western redcedar, western hemlock, Sitka spruce, red alder, salmonberry, swordfern, salal, skunkcabbage, reed, and rushes. Annual precipitation ranges from 100 to 165 inches The average annual air temperature is 47° to 50° F. The above 32° F growing season ranges from 160 to 190 days, and the above 28° F growing season ranges from 180 to 210 days. These soils are associated with Calawah, Hoko, Kalaloch, Klone, and Sekiu soils.

In a representative profile in a wooded area, a 5-inch layer of decayed and partly decayed forest litter covers the surface. The upper 7 inches of the soil is silty clay loam that is dark reddish brown in the upper part and very dark gray below. Beneath this, to a depth of 17 inches, is grayish-brown, mottled heavy silty clay loam. The next layer, to a depth of 27 inches, is grayish-brown, mottled light silty clay. Beneath this is olive-gray, mottled heavy silty clay loam that extends to a depth of 42 inches. Below a depth of 42 inches is very fine sandy loam that has strong-brown mottles.

Tealwhit soils are used mainly for production of trees and for wildlife habitat and recreation areas.

Tealwhit silty clay loam, 0 to 8 percent slopes (TEB).—This soil is in concave to nearly level depressions and on flat to gently sloping, low terraces and stream and river backwater areas.

Representative profile in SE¼SW¼SW¼ sec. 20, T. 26 N., R. 13 W., 2.1 miles west of U.S. Highway 101 on Hoh Indian Reservation Road, 0.3 miles southwest on logging road, 50 feet east of road, and about 60 feet north of Fletcher Creek:

O1—5 inches to 2 inches, leaves, needles, bark, and fragments of wood.

O2—2 inches to 0, dark reddish-brown (5YR 2/2), partly decayed leaves, needles, bark, and fragments of wood.

A1—0 to 4 inches, dark reddish-brown (5YR 2/2) silty clay loam, reddish gray (5YR 5/2) dry, moderate, medium and coarse, granular structure, hard, friable, slightly sticky, plastic, common fine and medium roots; few fine, soft iron-manganese concretions; very strongly acid; clear, wavy boundary. (2 to 5 inches thick)

A3—4 to 7 inches, very dark gray (5YR 3/1) and dark reddish-brown (5YR 3/2) silty clay loam, gray (5YR 5/1) and reddish gray (5YR 5/2) dry, moderate, fine and medium, subangular blocky structure; hard, friable, sticky, plastic, common fine and medium roots; few fine, soft iron-manganese concretions; strongly acid; clear, wavy boundary. (2 to 4 inches thick)

B21g—7 to 17 inches, grayish-brown (2 5Y 5/2) and light olive-brown (2.5Y 5/4) heavy silty clay loam, light gray (2.5Y 7/2) and pale yellow (2.5Y 7/4) dry; common, fine, prominent yellowish-red (5YR 4/6) mottles, strong, fine and very fine, subangular blocky structure; hard, friable, sticky, plastic; common fine roots, some peds have dark reddish-brown (5YR 2/2) organic coatings, strongly acid; clear, wavy boundary. (5 to 14 inches thick)

B22g—17 to 27 inches, grayish-brown (2.5Y 5/2) and light olive-brown (2.5Y 5/4) light silty clay, light gray (2.5Y 7/2) and pale yellow (2 5Y 7/4) dry; moderate, medium, prismatic structure parting to moderate, fine and medium, subangular blocky structure, very hard, firm, very sticky, very plastic; common fine roots; strongly acid, gradual, wavy boundary. (6 to 12 inches thick)

B3g—27 to 42 inches, olive-gray (5Y 5/2) heavy silty clay loam, light gray (5Y 7/2) dry; common, medium, prominent yellowish-red (5YR 5/6 and 5/8) mottles; weak, coarse, prismatic structure, hard, firm, sticky, plastic, few fine roots; strongly acid, clear, wavy boundary. (7 to 15 inches thick)

IICg—42 to 60 inches, gray (5Y 5/1) very fine sandy loam, light gray (5Y 7/1) dry; few, fine and medium, prominent strong-

brown (7.5YR 5/6 and 5/8) mottles, massive; hard, firm, slightly sticky, slightly plastic, few fine roots, medium acid.

The A horizon is very dark grayish-brown, dark-brown, and dark reddish-brown silty clay loam and clay loam. The C horizon is gray and olive brown. It has few to common fine and medium, strong-brown and reddish-yellow mottles. Textures of the C horizon are very fine sandy loam, silty clay loam, sandy clay loam, and sandy clay. Very fine glacial gravel in compact, till-like material is at a depth of 40 to 50 inches in places. Thick accumulations of humus have filtered into the B horizons in places, forming thick, dark reddish-brown coatings.

This soil is poorly drained. Permeability is slow. Roots penetrate to a depth of 60 inches. This soil holds 8 to 11 inches of water available for plants. Runoff is very slow to ponded, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 0 to 6 inches.

This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Conifers generally are stunted and are subject to tree rot. Capability unit VIw-1; woodland group 4w1.

Tidal Marsh

Tidal marsh (Td) consists of nearly level, extremely wet, salty, or brackish areas within the overflow limits of high tides. Soil materials in most places are deep deposits of heterogeneous river alluvium that are continually saturated with salt water. No soil formation has taken place. These mixed materials are gray or greenish gray and mottled. Capability unit VIIIw-1; not assigned to a woodland group.

Tisch Series

The Tisch series consists of poorly drained soils that formed in alluvium, volcanic ash, and diatomaceous earth. These soils are in upland basins. Slopes range from 0 to 2 percent. Elevation ranges from 50 to 800 feet. Native vegetation consists mostly of grasses, sedges, willow, alder, western hemlock, and western redcedar. Annual precipitation ranges from 20 to 60 inches. The average annual air temperature is about 50° F. The above 32° F growing season ranges from 220 to 260 days, and the above 28° F growing season ranges from 250 to 290 days. These soils are associated with Belfast, McMurray, Mukilteo, Semiahmoo, and Snohomish soils.

In a representative profile the upper 8 inches of the soil is black silt loam. Below this, to a depth of 14 inches, is very dark grayish-brown silt loam. The underlying material consists of three layers: a white layer, between depths of 14 and 20 inches, of silty volcanic ash and diatomaceous earth; a grayish-brown layer, between depths of 20 and 31 inches, of silty volcanic ash and diatomaceous earth; and an olive-gray layer, between depths of 31 and 54 inches, of stratified loamy sand and silty clay loam. The profile is slightly acid to neutral.

Tisch soils are used mainly for pasture, wildlife habitat, and recreation areas. About 60 percent of the acreage is cultivated.

Tisch silt loam (Th).—This nearly level soil is on upland basins, generally in close association with moderately shallow muck and peat soils. Slopes are 0 to 2 percent.

Representative profile 0.7 mile north of Chimacum on the Bailey farm in SE¼NW¼ sec. 11, T. 29 N., R. 1 W., directly west of Bailey house and 200 feet west of toe of slope:

Ap—0 to 8 inches, black (5YR 2/1) silt loam, dark reddish brown (5YR 3/2) dry; moderate, medium, granular and weak, thick, platy structure, slightly hard, friable, slightly sticky, slightly plastic; many fine, fibrous roots; slightly acid, clear, wavy boundary. (6 to 10 inches thick)

A3—8 to 14 inches, very dark grayish-brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; few, fine, distinct dark-brown (7.5YR 4/4) mottles; weak, thick, platy and moderate, medium, prismatic structure; slightly hard, friable, slightly sticky, plastic; few fine, fibrous roots; slightly acid, clear, wavy boundary. (5 to 10 inches thick)

C1—14 to 20 inches, white (2.5Y 8/2) silt, white (N 8/0) dry; thick, platy structure; slightly hard, firm; few fine, fibrous roots; neutral; clear, wavy boundary. (5 to 10 inches thick)

C2—20 to 31 inches, grayish-brown (2.5Y 5/2) silt, light gray (2.5Y 7/2) dry; thick, platy structure; slightly hard, firm; few roots; organic stains in pores; few grains of medium sand, some of which are mica flakes; neutral, abrupt, smooth boundary. (2 to 12 inches thick)

C3—31 to 60 inches, olive-gray (5Y 5/2), stratified loamy sand and silty clay loam, light gray (5Y 7/2) dry; few, fine, distinct dark yellowish-brown (10YR 4/4) mottles; massive; slightly hard, firm, sticky, slightly plastic; neutral.

The organic-matter content of the Ap horizon ranges from 15 to 20 percent. The A3 horizon ranges from very dark gray to very dark grayish brown and is more than 5 percent organic matter. The C1 and C2 horizons are white, pale yellow, light yellowish brown, grayish brown, and light olive brown. The C3 horizon is olive gray, gray, and dark gray. It is stratified. Thin layers of muck and peat are present in places below a depth of 24 inches.

This soil is poorly drained. Permeability is moderately slow. Roots penetrate to a depth of more than 60 inches. This soil holds about 9 to 11 inches of water available for plants. Runoff is ponded to very slow, and the hazard of water erosion is slight or nonexistent. A seasonal water table is at a depth of ½ to 1½ feet.

Most of the acreage of this soil has been cleared and is used for growing pasture or home garden berries and vegetables. About 25 percent of the acreage is in trees, mostly alder and willow, and is used for wildlife habitat and recreation areas. Capability unit IIIw-1; not assigned to a woodland group.

Townsend Series

The Townsend series consists of moderately well drained soils that have a very slowly permeable cemented layer at a depth of 24 to 36 inches. They are on glacial terraces. Slopes range from 0 to 15 percent. Elevation ranges from slightly above sea level to about 200 feet. These soils formed in glacial till under native vegetation consisting mostly of bunchgrasses, small shrubs, and a scattering of Douglas-fir, white oak, and madrone. Annual precipitation ranges from 18 to 20 inches. The average annual air temperature is 50 to 51° F. The above 32° F growing season ranges from about 240 to 270 days, and the above 28° F growing season ranges from 300 to 330 days. These soils are associated mainly with Clallam and San Juan soils.

In a representative profile the upper 18 inches of the soil is black gravelly loam. Below this, to a depth of 24 inches, is very dark brown gravelly sandy loam. Beneath this is dark grayish-brown gravelly sandy loam that extends to a depth of 36 inches. At a depth of 36 inches is a cemented layer that formed in very compact glacial till. The soil is slightly acid and contains gravel and cobbles of all sizes.

Townsend soils are used mainly for urban and rural homesites and for growing many garden crops.

Townsend gravelly loam, 0 to 15 percent slopes (TnC).—This nearly level to strongly sloping soil is on glacial terraces. Most slopes range from 3 to 8 percent.

Representative profile in Port Townsend, east side of Washington Street at the foot of Pierce Street, 50 yards

back from the edge of the bluff:

Ap—0 to 5 inches, black (5YR 2/1) gravelly loam, very dark gray (5YR 3/1) dry; moderate, medium, granular structure; soft, very friable, nonsticky, slightly plastic, many fine, fibrous roots; 20 percent gravel, slightly acid, abrupt, wavy boundary. (4 to 8 inches thick)

A1—5 to 18 inches, black (5YR 2/1) gravelly loam, very dark gray (5YR 3/1) dry, weak, medium, angular blocky structure, soft, friable, nonsticky, slightly plastic; many fine, fibrous roots; 40 percent gravel; slightly acid, clear, wavy boundary. (8 to 13 inches thick)

B2—18 to 24 inches, very dark brown (10YR 2/2) gravelly sandy loam, dark gray (10YR 4/1) dry; weak, medium, prismatic structure that parts to moderate, medium, subangular blocky; slightly hard, firm, slightly sticky, slightly plastic, few fine, fibrous roots, few thin, patchy clay films in pores, 40 percent gravel, slightly acid; clear, wavy boundary. (4 to 10 inches thick)

C1—24 to 36 inches, dark grayish-brown (10YR 4/2) gravelly sandy loam, light grayish brown (10YR 6/2) dry, common, medium, prominent yellowish-red (5YR 4/6) mottles; slightly hard, firm, nonsticky, nonplastic, few fine, fibrous roots; thin, patchy clay films in a few pores, 45 percent gravel and cobbles, slightly acid; gradual, irregular boundary. (8 to 15 inches thick)

C2sim—36 to 48 inches, grayish-brown (10YR 5/2), weakly cemented gravelly sandy loam, light brownish gray (10YR 6/2) dry; common, medium, distinct yellowish-red (5YR 4/6) and reddish-brown (5YR 4/4) mottles; massive; extremely hard, extremely firm, 45 percent gravel; slightly acid, diffuse, smooth boundary. (10 to 16 inches thick)

C3 48 inches, very compact gravelly sandy loam glacial till. (Many feet thick)

The depth to the cemented layer ranges from 24 to 36 inches. The A horizons range from black to very dark gray The B2 horizon is very dark brown to dark-brown gravelly loam and gravelly sandy loam. The C1 horizon ranges from dark grayish brown to brown and has pockets of loamy sand. The C2sim horizon is grayish brown, light brownish gray, or pale brown. It formed in very compact glacial till that is many feet thick

Permeability is moderate above the cemented layer. The soil holds 3 to 5 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. A perched water table is on top of the cemented layer during the rainy season.

Most of the acreage of this soil is in the city and urban areas. It is used extensively for houses and surrounding property where a great variety of flowers, berries and other fruits, and vegetables are grown. Capability unit IVe-1, woodland group 5f2.

Townsend fine sandy loam, 0 to 15 percent slopes (TlC).—This nearly level to strongly sloping soil is in narrow strips along marine bluffs. In these areas strong prevailing winds blow fine sand from beaches and bluffs and deposit it on the surface. This soil is generally fine sandy loam to a depth of 14 to 22 inches.

The hazard of bluff slippage or slough-off is moderate to severe. Permeability is moderate above the cemented layer. The soil holds 2 to 5 inches of water available for plants.

This soil is used mainly for rural homesites and for growing a variety of fruits, berries, and garden vegetables Capability unit IVe-1; woodland group 5f2.

Triton Series

The Triton series consists of moderately well drained, very gravelly soils that have a very slowly permeable cemented layer at a depth of 12 to 20 inches. These soils are underlain by basalt bedrock. They are on uplands in mountainous terrain. Slopes range from 0 to 70 percent. Elevation ranges from about 400 to 1,800 feet. These soils formed in glacial till under a cover consisting mainly of Douglas-fir, western hemlock, western redcedar, wild cherry, red alder, madrone, rhododendron, and evergreen huckleberry. Annual precipitation ranges from 55 to 65 inches. The average annual air temperature is about 49° F. The above 32° F growing season ranges from about 160 to 190 days, and the above 28° F growing season ranges from about 170 to 220 days. These soils are associated with Ahl, Grove, and Hoodsport soils.

In a representative profile the upper 7 inches of the soil is dark-red very gravelly loam. Below this, to a depth of 13 inches, is yellowish-red very gravelly loam. Beneath this, and extending to a depth of 17 inches, is dark-brown very gravelly sandy loam Below this is a grayish-brown cemented layer that rests on bedrock.

Triton soils are used almost exclusively for production of trees and for recreation areas and wildlife habitat.

Triton very gravelly loam, 0 to 30 percent slopes (TrD).—This nearly level to hilly soil is on mountain foothills. Most slopes range from 10 to 20 percent.

Representative profile 0.8 mile northwest of Dosewallips River road on Rocky Brook road in the NE¼NE¼SE¼ sec 28, T. 26 N., R. 2 W., 15 feet north of road:

O1—1½ inches to ½ inch, needles, leaves, twigs, bark, and fragments of wood.

O2—½ inch to 0, dark reddish-brown (5YR 2/2), decomposing organic litter; medium acid, abrupt, smooth boundary.

B21ir—0 to 7 inches, dark-red (2.5YR 3/6) and dark reddish-brown (5YR 3/3) very gravelly loam, red (2.5YR 5/6) and reddish brown (5YR 5/3) dry, weak, fine and medium, granular and weak, fine, subangular blocky structure; soft, very friable, slightly sticky, slightly plastic, many fine and medium roots; 55 percent angular basalt pebbles; medium acid; clear, wavy boundary. (5 to 8 inches thick)

B22ir—7 to 13 inches, yellowish-red (5YR 4/6) and reddish-brown (5YR 5/4) very gravelly loam, reddish yellow (5YR 6/6) and pink (5YR 7/4) dry; weak, fine and very fine, subangular blocky structure, soft, friable, slightly sticky, slightly plastic; many fine and medium roots; 60 percent angular basalt pebbles; slightly acid; gradual, wavy boundary. (5 to 7 inches thick)

C1—13 to 17 inches, dark-brown (7.5YR 4/4) very gravelly sandy loam, light brown (7.5YR 6/4) dry; massive; hard, firm, nonsticky, nonplastic; common fine and medium roots; 70 percent angular basalt and glacial pebbles; medium acid; clear, wavy boundary. (2 to 5 inches thick)

C2sim—17 to 38 inches, grayish-brown (10YR 5/2), weakly cemented very gravelly sandy loam, light gray (10YR 7/2) dry; massive, laminations in places; extremely hard, extremely firm, manganese and iron staining in cracks of upper 12 inches of horizon; fine root mat on top of cemented layer and in cracks, 55 percent coarse fragments in which granitic and quartzitic gravel and cobbles are dominant; slightly acid; abrupt, smooth boundary. (12 to 34 inches thick)

IIR—38 inches, basalt bedrock.

The depth to the cemented layer ranges from 12 to 20 inches. The B21ir horizon ranges from dark reddish brown to reddish brown and dark red. The B22ir horizon ranges from red to yellowish red. The C1 horizon is dark brown and dark yellowish brown. The Csim horizon is grayish brown to light brownish gray. Dark reddish-brown iron-manganese stains are cracks in this horizon.

This soil is moderately well drained. Permeability is moderate above the cemented layer. Roots penetrate to the cemented layer. This soil holds about 1 to 2 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. A perched water table is on top of the cemented layer during the rainy season.

This soil is used for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 4d2.

Triton very gravelly loam, 50 to 70 percent slopes (TrF).—This steep to very steep soil is on mountain slopes that include small areas of basalt bedrock outcroppings and

escarpments. Along the upper part of the slopes the soil is shallower to the cemented layer than it is along the lower part of the slopes.

Runoff is rapid to very rapid, and the hazard of water erosion is severe to very severe. Most of the acreage of this soil is used for production of trees and for wildlife habitat and recreation areas Capability unit VIIe-1; woodland group 4d2.

Tukey Series

The Tukey series consists of moderately well drained, gravelly soils that have a very slowly permeable cemented layer at a depth of 20 to 40 inches. These soils formed on terraces in glacial till. Slopes range from 0 to 30 percent. Elevation ranges from slightly above sea level to about 500 feet. Native vegetation consists mostly of Douglas-fir, western redcedar, western hemlock, red alder, willow, wild cherry, rhododendron, salal, and bracken. Annual precipitation ranges from 17 to 25 inches. The average annual air temperature is 50° F The above 32° F growing season is about 260 days, and the above 28° F growing season is about 320 days. These soils are associated mainly with Agnew, Cassolary, Clallam, Dick, Everett, and Whidbey soils.

In a representative profile in a wooded area, a thin layer of organic litter covers the surface. The upper 8 inches of the soil is gravelly loam that is grayish brown in the upper part and dark brown in the lower part. Below this, to a depth of 15 inches, is brown gravelly loam. Beneath this, and extending to a depth of 30 inches, is grayish-brown gravelly clay loam. The next layer, to a depth of 36 inches, is dark yellowish-brown, hard, firm gravelly loam. Below a depth of 36 inches is an olive-brown cemented layer that formed in very compact glacial till. Cobblestones and stones are on the surface and throughout the soil.

About half the acreage of Tukey soils is in small ranches or is used for rural homesites and for growing pasture, hay, berries, and vegetables. Besides tree production, wooded areas of Tukey soils are also used for wildlife habitat and recreation areas.

Tukey gravelly loam, 0 to 15 percent slopes (TuC).—This nearly level to rolling soil is on glacial moraine terraces. Most slopes are 5 to 10 percent.

Representative profile 60 yards south of U.S. Highway 101, opposite pole number 1818 in NW¼SW¼ sec. 34, T. 30 N., R. 2 W.:

O1—1½ inches to 1 inch, needles, leaves, bark, fragments of wood, and moss.

O2—1 inch to 0, black (5YR 2/1), partly decomposed organic matter from needles, leaves, bark, fragments of wood, and moss, medium acid, abrupt, smooth boundary. (1 to 1½ inches thick)

A2—0 to 2 inches, grayish-brown (10YR 5/2) gravelly loam, gray (10YR 6/1) dry, weak, very fine, granular structure; soft, friable, nonsticky, nonplastic; many fine and medium roots; 25 percent gravel; medium acid, abrupt, smooth boundary. (2 to 3 inches thick)

B21—2 to 8 inches, dark-brown (10YR 4/3) gravelly loam, light brownish gray (10YR 6/2) dry; weak, fine, subangular blocky structure; soft, friable, nonsticky, slightly plastic, many fine and medium roots; 25 percent gravel, medium acid; gradual, wavy boundary. (4 to 7 inches thick)

B22—8 to 15 inches, brown (10YR 5/3) gravelly loam, light gray (10YR 7/2) dry; moderate, fine, subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic, many fine and medium roots, 40 percent gravel, medium acid, clear, wavy boundary. (5 to 7 inches thick)

B3—15 to 30 inches, grayish-brown (2.5Y 5/2) gravelly clay loam, light gray (2 5Y 7/2) dry; common, medium, prominent yellowish-red (5YR 4/6) mottles, weak, medium, prismatic structure, hard, firm, sticky, plastic; common fine roots; 40 percent gravel; medium acid; gradual, wavy boundary. (7 to 15 inches thick)

C1—30 to 36 inches, dark yellowish-brown (10YR 4/4) gravelly loam, very pale brown (10YR 7/4) dry, many, large, prominent yellowish-red (5YR 4/6) mottles and common, large, faint light brownish-gray (2.5Y 6/2) mottles; massive; hard, firm, slightly sticky, slightly plastic; few fine roots; 40 percent gravel; medium acid; gradual, wavy boundary. (2 to 6 inches thick)

C2sim—36 to 56 inches, olive-brown (2.5Y 4/4) weakly cemented gravelly loam, light brownish gray (2.5Y 6/2) dry; massive; extremely hard, extremely firm; 40 percent gravel; neutral; diffuse, smooth boundary. (18 to 24 inches thick)

C3—56 inches, very compact gravelly loam glacial till. (Many feet thick)

The depth to the cemented layer ranges from 20 to 40 inches The A2 horizon is grayish-brown to gray silt loam to gravelly loam The B21 horizon is dark-brown to dark yellowish-brown gravelly loam to gravelly clay loam. The B22 horizon is dark-brown to brown gravelly loam or gravelly clay loam. The B3 horizon is grayish-brown to olive-brown gravelly clay loam or gravelly loam. The C1 horizon ranges from brown to dark yellowish brown and the C2sim horizon ranges from yellowish brown to olive brown. Reaction ranges from strongly acid at the surface to neutral in the C horizons.

Included with this soil in mapping are small areas that contain enough cobbles and stones to hinder cultivation.

This soil is moderately well drained. Permeability is moderately slow above the cemented layer. Roots penetrate to the cemented layer. This soil holds about 3 to 6 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate. A perched water table is on top of the cemented layer during the rainy season.

This soil is used for permanent pastures of various grasses and legumes and for home-garden berries and vegetables. It is also used for production of trees. Capability unit IVe-1; woodland group 4d2.

Tukey gravelly loam, 15 to 30 percent slopes (TuD).—This hilly soil is on glacial terraces along the margins of steep ravines or waterways. Along the upper part of these hilly terraces, the depth to the cemented layer is 20 to 24 inches, and on the lower part the depth to the cemented layer is 24 to 36 inches.

Runoff is medium, and the hazard of water erosion is moderate. This soil is used mainly for production of trees and for wildlife habitat and recreation areas. Capability unit VIe-1; woodland group 4d2.

Wapato Series

The Wapato series consists of poorly drained soils that formed in glaciofluvial or marine sediments. They are underlain by stratified material of mixed origin. These soils are on bottom lands and basinlike areas. Slopes range from 0 to 3 percent. Elevation ranges from 20 to 300 feet. Native vegetation consists mostly of western redcedar, red alder, Douglas-fir, western hemlock, maple, willow, red elderberry, salmonberry, sedges, and swordfern. Annual precipitation ranges from 25 to 55 inches. The average annual air temperature is about 50° F. The above 32° F growing season ranges from 160 to 250 days, and the above 28° F growing season ranges from 215 to 300 days. These soils are associated mainly with Belfast and Lummi soils.

In a representative profile the upper 8 inches of the soil is black silty clay loam. This is underlain by three layers of

silty clay loam. The upper layer, between depths of 8 and 12 inches, is gray. The next, between depths of 12 and 16 inches, is greenish gray. The third, between depths of 16 and 24 inches, is dark greenish gray. Below this, to a depth of 60 inches, are stratified layers of greenish-gray loam, gray silty clay loam, and dark-gray loamy sand. These soils are medium acid to neutral.

Most of the acreage of Wapato soils is in permanent pasture Small areas are used mainly for growing trees and for wildlife habitat.

The Wapato soils in Jefferson County are outside of the range of the series because of hue, but this difference does not alter their usefulness or behavior.

Wapato silty clay loam (Wa).—This nearly level to gently undulating soil is in valleys or small basinlike areas. Most slopes range from 0 to 3 percent.

Representative profile 80 yards south and 0.2 mile east of the cemetery in NW¼SE¼ sec. 14, T. 27 N., R. 2 W.:

Ap—0 to 8 inches, black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak, medium and fine, granular structure, slightly hard, friable, slightly sticky, plastic; many fine roots; medium acid, abrupt, smooth boundary (7 to 9 inches thick)

B21g—8 to 12 inches, gray (10YR 5/1) silty clay loam, light brownish gray (10YR 6/2) dry; many, medium, prominent yellowish-red (5YR 5/8) mottles, moderate, fine, prismatic structure, hard, firm, sticky, plastic; common fine roots; slightly acid; gradual, smooth boundary (3 to 5 inches thick)

B22g—12 to 16 inches, greenish-gray (5GY 5/1) silty clay loam, light greenish gray (5GY 7/1) dry; many, coarse, prominent yellowish-red (5YR 5/8) mottles, moderate, medium, prismatic structure, hard, firm, sticky, plastic, few fine roots; slightly acid, gradual, wavy boundary. (4 to 7 inches thick)

B23g—16 to 24 inches, dark greenish-gray (5GY 4/1) silty clay loam, greenish gray (5GY 6/1) dry, many, coarse, prominent yellowish-red (5YR 4/8) mottles, moderate, coarse, prismatic and moderate, fine, subangular blocky structure, firm, sticky, plastic, few fine roots, neutral, clear, smooth boundary. (7 to 9 inches thick)

C1g 24 to 34 inches, greenish-gray (5GY 5/1) loam, light greenish gray (5GY 7/1) dry, many, coarse, prominent yellowish-red (5YR 4/8) mottles; massive; slightly hard, friable, slightly sticky, plastic; few fine roots; neutral, clear, smooth boundary. (8 to 10 inches thick)

C2g 34 to 42 inches, gray (5Y 5/1) silty clay loam, light brownish gray (2.5Y 6/2) dry; common, medium, distinct dark yellowish-brown (10YR 3/4) mottles and common, medium, prominent yellowish-red (5YR 5/8) mottles; massive; very hard, very firm, very sticky, very plastic; few fine roots; slightly acid; clear, smooth boundary. (8 to 10 inches thick)

C3g—42 to 60 inches, dark-gray (5Y 4/1) loamy sand, light brownish gray (2.5Y 6/2) dry, common, medium, prominent dark-brown (7.5YR 4/4) mottles; massive, soft, very friable, nonsticky, nonplastic; slightly acid.

The A horizon is black to very dark gray or very dark grayish-brown silty clay loam, heavy silt loam, and gravelly loam. The B horizons are gray to dark greenish-gray or olive-gray silty clay loam to silty clay. The C horizon is greenish-gray, gray, or dark-gray loam, silty clay loam, or silty clay in the upper part. The lower part is sand or loamy sand that contains a few waterworn pebbles or cobbles The coarse-textured materials generally are below a depth of 40 inches. Thin layers of loam or silt loam may be present at any depth in the profile.

This soil is poorly drained. Permeability is slow. Roots penetrate to a depth of more than 60 inches. This soil holds 8 to 10 inches of water available for plants. Runoff is very slow, and the hazard of water erosion is slight. The depth to the water table in undrained areas ranges from ½ to 1½ feet during rainy periods.

About 60 percent of the acreage of this soil is used for growing pasture and gardens and for rural homesites. Capability unit IIIw-1, woodland group 4w2.

Whidbey Series

The Whidbey series consists of well-drained, gravelly soils that have a very slowly permeable cemented layer at a depth of 20 to 40 inches. They are on glacial terraces. Slopes range from 0 to 30 percent. Elevation ranges from slightly above sea level to 600 feet. These soils formed in glacial till under vegetation that consists mainly of Douglas-fir, western redcedar, willow, rhododendron, and salal. Annual precipitation is 18 to 30 inches. The average annual air temperature is 50° F. The above 32° F growing season ranges from about 210 to 250 days, and the above 28° F growing season ranges from about 270 to 310 days. These soils are associated with Agnew, Clallam, Dick, Everett, Indianola, and Sinclair soils.

In a representative profile in a wooded area, a thin layer of organic litter covers the surface. The upper 3 inches of the soil is very dark gray gravelly sandy loam. Below this, to a depth of 21 inches, is dark-brown gravelly sandy loam. Beneath this, and extending to a depth of 26 inches, is grayish-brown gravelly sandy loam. Below this is a cemented layer. Cobbles and stones are present on the surface and throughout the profile.

Most areas of these soils are used for production of trees and are wooded. About 30 percent of the acreage has been cleared and is used for small ranches and rural summer homesites. If supplemental irrigation and fertilization are supplied, these soils can be used for permanent pasture, hay, and a variety of vegetable and berry crops.

Whidbey gravelly sandy loam, 0 to 15 percent slopes (WhC).—This nearly level to sloping soil is on glacial terraces. In most areas this soil has slopes of 4 to 8 percent.

Representative profile 100 feet north of logging road, 1,850 feet north and 530 feet east of the south quarter corner of sec. 27, T. 30 N., R. 1 W.:

O1—4 inches to 1 inch, needles, leaves, bark, and fragments of wood

O2—1 inch to 0, dark reddish-brown (5YR 2/2), partly decomposed needles, leaves, bark, and fragments of wood, medium acid; abrupt, wavy boundary. (½ to 1½ inches thick)

A1—0 to 3 inches, very dark gray (10YR 3/1) gravelly sandy loam, gray to light gray (10YR 6/1) dry; weak, very fine, granular structure; soft, very friable, nonsticky, nonplastic; many fine, medium, and coarse roots; 25 percent gravel; medium acid; clear, wavy boundary. (2 to 5 inches thick)

B2ir—3 to 21 inches, dark-brown (10YR 4/3) gravelly sandy loam, pale brown (10YR 6/3) dry; weak, fine and medium, subangular blocky structure, soft, very friable, nonsticky, nonplastic; many fine, medium, and coarse roots to a depth of 11 inches and common fine, medium, and coarse roots to a depth of 21 inches; common hard iron-manganese concretions; 40 percent gravel; medium acid, clear, wavy boundary. (15 to 23 inches thick)

C1—21 to 26 inches, grayish-brown (10YR 5/2) gravelly sandy loam, light gray (10YR 7/2) dry; common, medium, faint yellowish-brown (10YR 5/4) mottles, massive, hard, firm, nonsticky, nonplastic; few fine roots; 45 percent gravel; slightly acid, abrupt, wavy boundary. (0 to 12 inches thick)

C2sm—26 to 60 inches, light brownish-gray (10YR 6/2), weakly cemented gravelly sandy loam, white (10YR 8/2) dry, common medium, faint, yellowish-brown (10YR 5/4) mottles, massive, extremely hard, extremely firm; 40 percent gravel and 5 percent cobbles; slightly acid; diffuse, smooth boundary. (20 to 35 inches thick)

C3—60 inches, very compact gravelly sandy loam glacial till. (Many feet thick)

Depth to the cemented layer is 20 to 40 inches. The A1 horizon ranges from very dark gray to dark grayish brown. The B2ir horizon ranges from dark brown to dark yellowish brown. The C1 horizon ranges from hard to extremely hard when dry. Color ranges from grayish brown to light brownish gray. Reaction ranges from strongly acid in the A horizon to slightly acid in the C horizon.

Included with this soil in mapping are small areas of somewhat poorly drained soils and areas of somewhat excessively drained soils.

This soil is well drained. Permeability is moderately rapid above the cemented layer. Roots penetrate to the cemented layer. This soil holds 2 to 4 inches of water available for plants. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This soil is used mainly for production of trees and for wildlife habitat, recreation areas, and rural homesites. Some small areas are used for growing pasture, hay, and home garden crops. Capability unit IVe-1; woodland group 4d2.

Whidbey gravelly sandy loam, 15 to 30 percent slopes (WhD).—This hilly soil is on glacial terraces that merge with steep canyons and waterways, often near marine bluff escarpments. Along the upper part of hillsides the soil is generally 20 to 24 inches deep to the cemented layer. Along the lower part it is 24 to 40 inches deep to the cemented layer.

Runoff is medium, and the hazard of water erosion is moderate. This soil is used mainly for production of trees and for wildlife habitat, recreation acreas, and rural homesites. Some small areas are used for growing pasture, hay, and home garden crops. Capability unit VIe-1; woodland group 4d2.

Use and Management of the Soils

In this section the use and management of the soils of the Jefferson County Area are described. In the first part of the section an explanation of the capability classification system is given, and descriptions of the individual capability units are presented. Following this a table of estimated yields and a brief description of the management required to obtain the yields are provided. In the last part of the section are subsections on the use of soils of the Jefferson County Area for woodland, wildlife, and engineering.

General Principles of Soil Management

In the Jefferson County Area, the topography, temperature and precipitation, native vegetation, and soil vary widely. These differences lead to a diversity of problems or limitations in land use and soil management.

Good soil management in the Area calls for cropping sequences, maintenance of organic-matter content, proper choice and application of fertilizers, weed control, and control of erosion. In wooded areas good management is necessary to maintain the timber supply and the efficiency of the watersheds. Supplemental irrigation during occasional extended dry periods is recommended for optimum production.

Fertilizers.—For optimum production, apply considerable amounts of a complete, balanced fertilizer containing nitrogen, phosphate, and potash. Most soils in the Area are low in calcium, and applications of lime are often beneficial, especially when legumes are a part of the pasture mixture.

The western part of the Area has very high rainfall, which results in excessive soil leaching. In this part of the Area the common plant nutrients are needed in unusually large amounts. Minor elements may also be lacking. Copper is the minor element needed the most.

Soil tests should be made every 2 or 3 years and fertilizers applied according to results of the soil tests.

Erosion control.—Most of the erosion and runoff in the area occurs between November and March. Late in winter and early in spring, floods caused by heavy rain and melting snow cause severe streambank erosion along the major drainages and the intermittent tributaries. The floods frequently cut new channels, deposit coarse sand and gravel, and uproot trees on the valley bottom lands. In places this erosion has been controlled by diking and bank protection, but in most of the Area this type of protection is not feasible. Thus, land use has to be adjusted to allow for this hazard.

Logging operations that severely damage or destroy plant cover cause severe erosion. Woodland managers are becoming more aware of this and are adopting logging methods that cause minimum damage to the forest cover. Reforestation is becoming an important practice in the Area.

Soil erosion on construction sites, highways, industrial and residential developments, and in areas of single-family homes has always been a problem. Soil slippage frequently occurs where slopes have been disturbed by deep cuts. Well-managed construction projects include plans for control of water and silt during construction, and for revegetation and erosion-control structures after the project is completed.

Soil erosion on cropland is a concern where the soil is bare during the rainy season. Hay and pasture, however, are the major crops, and thus most of the cropland has yearlong protection. Cover crops grown in the intervals between cash crops help protect the soil. Other erosion-control practices include cross-slope tillage, planting row crops on the contour, special application of organic matter, and the use of vegetated waterways to handle excess water.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forest trees or engineering.

In the capability system, all kinds of soils are grouped at three levels: the capability class, subclass, and unit. These levels are described in the following paragraphs. The unit designation for each soil is given in the Guide to Mapping Units.

Capability Classes, the broadest groups, are designated by Roman numerals I through VIII The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use. (None in Jefferson County Area.)

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the

choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife. (None in Jefferson County Area.)

Class VI soils have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture or range, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuitable for cultivation and restrict their use largely to pasture or range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife, water supply, or to use for esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry. Subclass *c* is not used in this survey.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture or range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIw-3 or IIIe-1. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following paragraphs the capability units in the Jefferson County Area are described, and suggestions for the use and management of the soils are given.

CAPABILITY UNIT IIw-1

This unit consists of moderately well drained and poorly drained, nearly level variants of the Belfast series. These soils are on flood plains.

Permeability is moderately slow. Available water capacity is very high. Roots penetrate to a depth of more than 60 inches. Low-lying areas are subject to occasional overflow. Runoff is very slow, and there is little or no hazard of water erosion. A seasonal water table is at a depth of 6 to 48 inches.

If properly drained, these soils are suited to a variety of crops. They are used mostly for grazing stock and for growing hay and silage. They are also used for growing grains, berries, fruit trees, and truck and field crops. Adequate drainage is generally needed for all crops. Open-ditch and tile drains are used in these soils, but tile drains are more suitable. Dikes are needed along low bottom lands that are subject to occasional overflow.

Suitable permanent pasture plants are tall fescue, meadow foxtail, orchard-grass, timothy, lotus major, and red and white clover. Oats and rye are suitable for use as green-manure crops and cover crops.

CAPABILITY UNIT IIw-2

This unit consists of poorly drained and very poorly drained, nearly level, organic and mixed organic-mineral soils of the McMurray, Mukilteo, Semiahmoo, and Snohomish series and variants of the Mukilteo and Semiahmoo series. These soils are in depressions and on flood plains.

Permeability is moderate to slow. Available water capacity is very high. Roots can penetrate to a depth of more than 60 inches. Runoff is very slow to ponded, and there is little or no hazard of water erosion.

These soils require extensive drainage before crops can be grown. They are used mostly for permanent pasture and for growing hay and silage. Among the specialty crops well suited to these soils are mint, vegetables, bulbs, and blueberries. Open-ditch and tile drains are used to control the water level, but locating drainage outlets is often difficult. When cultivated, peat and muck soils settle from ¾ to 1 inch per year. If the water table is below a depth of 30 inches in the deeper soils, the rate of settling is accelerated. Organic soils less than 24 inches deep require less drainage than deeper ones.

Suitable permanent pasture plants in drained areas are meadow foxtail, tall fescue, timothy, lotus major, New Zealand white clover, and big trefoil.

Under clean cultivation, dry soils are subject to soil blowing. Buried logs and stumps make cultivation of the recently cleared organic soils difficult.

CAPABILITY UNIT IIw-3

This unit consists of well-drained, nearly level soils of the Belfast series. These soils are on a flood plain.

Available water capacity is moderately high to very high. Runoff is very slow, and there is little or no hazard of water erosion except for overflow and deposition from occasional flooding.

River overflow is more frequent in some areas than in others but generally occurs no more often than once every 10 years, and in some areas no more often than once every 30 to 40 years. Diking is beneficial in places.

Crops that are well suited to these soils include most vegetables, strawberries, cane berries, tree fruits, small grains, nursery stock, and permanent pasture.

Suitable permanent pasture plants are orchardgrass, tall fescue, meadow foxtail, ryegrass, timothy, alfalfa, and red and white clover. Supplemental sprinkler or rill irrigation may be required during summer months.

CAPABILITY UNIT IIIe-1

This unit consists of well-drained and moderately well drained soils of the Cassolary, Cathcart, Kitsap, and Quil-

cene series. These soils are on uplands. Slopes are 0 to 15 percent.

Permeability is moderate to very slow. Available water capacity is moderate to high. Roots can penetrate to a depth of 24 to more than 60 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

Crops that are suited to these soils include permanent pasture for grazing, hay, and silage; strawberries; raspberries; and truck and field crops. Truck and field crops that have a potential commercial value include strawberries, cane berries, lettuce, carrots, beets, beans, brussel sprouts, broccoli, cabbage, oats, and rye. Drainage is needed on the moderately well drained soils. Tile and open ditch drains are used, but tile drains are preferable.

Practices to control erosion include cross-slope tillage, vegetated waterways, diversion terraces to intercept water from steeper slopes, and use of sod-forming grasses in the cropping system.

Suitable permanent pasture plants are orchardgrass, tall fescue, timothy, and red and white clover. Alfalfa can be grown instead of clover on the soils that lack a layer restricting root penetration.

CAPABILITY UNIT IIIw-1

This unit consists of somewhat poorly drained and poorly drained soils of the Agnew, Casey, Lummi, Tisch, Wapato, and Belfast, wet variant, series. Slopes are 0 to 8 percent.

Permeability is moderate to slow. Available water capacity is high to very high. Runoff ranges from ponded or very slow to slow, and there is little or no hazard of erosion. The Belfast, wet variant, soil is subject to occasional flooding from streams.

These soils require adequate drainage before most crops can be grown. They are used mostly for growing permanent pasture, hay, and silage. A variety of small grains, garden vegetables, tree fruits, and berry crops are also grown successfully on them. Open-ditch and tile drains are suitable for controlling the water level. The Belfast, wet variant, requires diking in places, along with good drainage. Unless areas of it are diked, drained, or both, the soil is limited generally to forage crops that tolerate periods of overflow and soil wetness.

Suitable permanent pasture plants in drained areas are orchardgrass, meadow foxtail, timothy, lotus major, and red and white clover.

The silt loam and silty clay loam soils tend to become cloddy if cultivated when wet.

CAPABILITY UNIT IVe-1

This unit consists of well-drained and moderately well drained soils of the Alderwood, Cassolary, Clallam, Hoodsport, Kitsap, Sinclair, Townsend, Tukey, and Whidbey series. These soils are on uplands. Slopes are 0 to 15 percent.

Permeability is slow to very slow. Available water capacity is low to moderately high. Roots penetrate to a depth of 20 to 40 inches. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

These soils are used mostly for production of trees and for permanent pasture, hay, and silage. They are also used for and suited to growing small grains, strawberries, cane berries, and a variety of vegetable crops. Cross-slope tillage, vegetated waterways, diversion terraces to intercept water from steeper slopes, and the use of sod-forming grasses in the cropping system help control erosion.

Suitable permanent pasture plants are tall fescue, orchardgrass, timothy, ryegrass, and red and white clover.

CAPABILITY UNIT IVe-2

This unit consists of somewhat excessively drained soils of the Lystair and Indianola series. These soils are on uplands. Slopes are 0 to 15 percent.

Permeability is moderately rapid to rapid. Available water capacity is moderate to moderately high. Roots can penetrate to a depth of 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

These soils require special erosion-control practices before crops can be grown. They are used mainly for production of trees and for permanent pasture, hay, and silage. Other crops grown on these soils include strawberries, cane berries, small grains, and vegetables. Cross-slope tillage, vegetated waterways, diversion terraces to intercept water from steeper slopes, and the use of sod-forming grasses in the cropping system help control erosion. Irrigation is required during the summer, and periodic additions of a complete fertilizer are needed.

Suitable permanent pasture plants are orchardgrass, tall fescue, cascade lotus, red and white clover, alfalfa, and ladino clover.

CAPABILITY UNIT IVe-3

This unit consists of well-drained and moderately well drained soils of the Cassolary, Cathcart, Kitsap, and Quilcene series. Slopes are 15 to 30 percent.

Permeability is moderate to very slow. Available water capacity is moderate to high. Roots penetrate to a depth of 24 to more than 60 inches. Runoff is medium to rapid, and the hazard of water erosion and landslip are especially severe on the Kitsap soil.

These soils are suitable for production of trees, for growing crops, and for use as recreation areas. They are used mostly for production of trees and for permanent pasture, hay, silage, and recreation areas. If erosion is controlled, the soils can be used for growing strawberries, cane berries, small grains, and numerous vegetable crops. Cross-slope tillage, vegetated waterways, diversion terraces to intercept water from steeper slopes, and use of sod-forming grasses for several years in the cropping system help to control erosion.

Suitable permanent pasture plants are tall fescue, orchardgrass, timothy, ryegrass, and red and white clover. Alfalfa can be grown instead of clover on the Cassolary soils.

CAPABILITY UNIT IVw-1

This unit consists of somewhat poorly drained and moderately well drained soils of the Swantown and Alderwood series These soils are on uplands. Slopes are 0 to 15 percent.

Permeability is moderately rapid to moderate above the cemented layer. Available water capacity is low to moderately high. Roots penetrate to a depth of 20 to 40 inches. A perched water table is at a depth of 6 to 36 inches during the rainy season. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

These soils are used for pasture and for growing hay, silage, and family vegetable gardens. Drainage is needed in places. Open-ditch and tile drains are used. These soils sometimes dry out late in summer and early in fall, so supplemental irrigation is beneficial.

Suitable pasture plants are tall fescue, meadow foxtail, timothy, lotus major, and red and white clover.

CAPABILITY UNIT IVw-2

This unit consists of well-drained and moderately well drained, nearly level soils of the Hoh and Queets series These soils are on flood plains.

Permeability is moderate to moderately rapid. Available water capacity is moderately high to high. Roots penetrate to a depth of more than 60 inches. Runoff is slow to very slow. In places the soils are subject to overflow.

These are among the best potential crop-producing soils of the high rainfall areas. Under good management, including large applications of fertilizers, they are suitable for growing pasture, hay, silage, cane berries, tree fruits, and family vegetable gardens. Open-ditch or tile drainage is sometimes required before deep-rooted crops can be grown. Diking is beneficial in places.

Suitable pasture plants, used in mixtures, are pasture orchardgrass, tall fescue, timothy, meadow foxtail, lotus major, big trefoil, and red and white clover.

CAPABILITY UNIT VIe-1

These are mostly moderately well drained to somewhat excessively drained soils of the Agnew, Alderwood, Beausite, Calawah, Cassolary, Cathcart, Clallam, Dabob, Everett, Grove, Hoodsport, Hoko, Hoypus, Indianola, Kalaloch, Kitsap, Klone, Olete, Quilcene, Sinclair, Snahopish, Solleks, Triton, Tukey, and Whidbey series. These soils are on uplands. Slopes range from 0 to 60 percent.

Permeability is rapid to very slow. Available water capacity is very low to very high. Roots penetrate to a depth of 12 to more than 60 inches. Runoff is slow to very rapid, and the hazard of water erosion is slight to severe.

These soils are generally better suited to production of trees and to use as wildlife habitat and recreation areas than to other uses. If fertilizer is properly applied and supplemental irrigation is properly executed, permanent pasture can be grown in places where slopes are less than 30 percent. Specialty crops can be grown on a few of the soils in this unit, but they require large quantities of fertilizers.

Suitable pasture plants are tall fescue, orchardgrass, ryegrass, timothy, and red and white clover.

CAPABILITY UNIT VIw-1

This unit consists of moderately well drained to poorly drained soils of the Huel, Sekiu, and Tealwhit series and the wet variant of the Hoko series. Slopes are 0 to 8 percent.

Permeability is rapid to very slow. Available water capacity is low to very high. Roots penetrate to a depth of 8 to more than 60 inches. Runoff is slow to ponded, and the hazard of water erosion is slight.

These soils are better suited to production of trees and to use as wildlife habitat and recreation areas than to other uses. Drainage of these soils is not economically feasible.

CAPABILITY UNIT VIs-1

This unit consists of well-drained and somewhat excessively drained soils of the Beausite, Carlsborg, Dick, Grove, Hoypus, Itswoot, Indianola, and San Juan series and the land type Rock outcrop. These soils and the land type are on uplands. Slopes are 0 to 60 percent.

Permeability is moderate to very rapid. Available water capacity is low to moderately high. Roots can penetrate to a depth of 3 to 60 or more inches. Runoff is slow to very rapid, and the hazard of water erosion is slight to very severe.

These soils are generally are best suited to production of trees and to use as wildlife habitat and recreation areas than to other uses. Some of these soils, particularly the sandy ones that have 0 to 15 percent slopes, occasionally are used for growing permanent pasture and other crops suited to sandy soils.

Suitable pasture plant are tall fescue, orchardgrass, ryegrass, alfalfa, and red and white clover.

CAPABILITY UNIT VIIe-1

This unit consists of well-drained to moderately well drained soils of the Ahl, Phelan, and Triton series. Slopes are 30 to 80 percent.

Permeability is moderate to the bedrock or cemented layer. Available water capacity is very low to moderate. Roots penetrate to a depth of 10 to 40 inches Runoff is rapid to very rapid, and the hazard of water erosion is severe to very severe.

These soils are better suited to production of trees and to use as wildlife habitat and recreation areas than to other uses. They make up a large area of important watershed. A continuous protective cover of native plants helps control erosion.

CAPABILITY UNIT VIIs-1

This unit consists of well-drained and somewhat excessively drained soils of the Ahl, Dimal, and Olete series and the land types Rock land and Rock outcrop. Slopes are 50 to 90 percent.

Runoff is very rapid, and the hazard of water erosion is severe to very severe.

These soils are better suited to production of trees and to use as wildlife habitat and recreation areas than to other uses. They are important for watershed. A continuous protective cover of native plants helps control water erosion.

CAPABILITY UNIT VIIIe-1

This unit consists of areas of Rough broken land. These areas are on very steep coastal bluffs that are subject to severe and very severe landslips and water erosion. This land type is not suited to crops.

CAPABILITY UNIT VIIIw-1

This unit consists of Coastal beaches, Cut and fill land, Riverwash, and Tidal marsh. These land types are not suited to crops.

Estimated Yields

Table 2 shows the estimated average yields per acre for the principal crops grown the survey area. Dashes indicate that the soil is not commonly used for a given purpose, or that its use is not recommended because of the severe hazard of erosion. Yields shown are for a moderately high level of management.

To obtain the yields given in the table 2, most, if not all, of the following practices should be used:

1. Growing varieties of plants suited to the soils.
2. Renovating hay and pasture plantings when stands decline in vigor or become infested with weeds.
3. Alternating crops in the cropping system with grain or an adapted tilled crop to help control weeds.
4. Planting a deep-rooted crop to improve penetration of water, air, and roots.

TABLE 2.—*Estimated yields per acre of common crops*

[Dashes indicate that the soil is unsuited to the crop or the crop is not commonly grown. Soils that are not generally cultivated are excluded]

Soil	Pasture		Alfalfa	Straw-berries	Rasp-berries	Potatoes
	Orchard-grass and New Zealand white clover	Tall fescue and New Zealand white clover				
	A.U.M.[1]	*A.U.M.*	*Tons*	*Tons*	*Tons*	*Tons*
Agnew silt loam, 0 to 8 percent slopes	10.5	10.5				
Alderwood gravelly sandy loam, 0 to 15 percent slopes	7.5	7.5	5	3	3	
Alderwood gravelly sandy loam, 15 to 30 percent slopes	7.0	7.0	3			
Alderwood gravelly loam, 0 to 15 percent slopes	10.5	10.5	5	3	3	
Alderwood-Quilcene complex, 0 to 15 percent slopes	12.0	12.0		3		
Belfast fine sandy loam	10.5	10.5	5	3	3	
Belfast silt loam	12.5	12.0	6	3	3	8
Belfast silt loam, heavy variant	12.0	12.0	6	3	3	8
Belfast silt loam, wet variant		12.0				
Belfast silty clay loam, wet variant		12.0				
Carlsborg gravelly loamy sand, 0 to 15 percent slopes	4.5	4.5				
Casey fine sandy loam, 0 to 8 percent slopes		10.5				6
Casey silt loam, 0 to 8 percent slopes		12.0				7
Cassolary sandy loam, 0 to 15 percent slopes	10.5	10.5	5		2	7
Cathcart gravelly silt loam, 0 to 15 percent slopes	10.5	10.5				
Cathcart gravelly silt loam, 15 to 30 percent slopes	9.0	9.0				
Clallam gravelly sandy loam, 0 to 15 percent slopes	7.5	7.5	5	3	3	
Hoh fine sandy loam		10.5				
Hoh silt loam		10.5				
Hoodsport gravelly loam, 0 to 15 percent slopes	7.5	7.5				
Indianola sandy loam, 0 to 15 percent slopes	6.0	6.0	4	2	2	
Kitsap gravelly loam, 0 to 15 percent slopes	10.5	10.5				
Kitsap silt loam, 0 to 15 percent slopes	10.5	10.5				
Lummi silt loam		12.0				
Lystair fine sandy loam, 0 to 15 percent slopes	6.0	6.0	3	1.5	1.5	
McMurray and Mukilteo peats		10.5				12
Mukilteo peat, moderately shallow variant		10.5				12
Queets silt loam		10.5				
Quilcene silt loam, 0 to 15 percent slopes	10.5	10.5				
Semiahmoo muck		10.5				12
Semiahmoo muck, moderately shallow variant		10.5				12
Semiahmoo muck, shallow variant		10.5				12
Sinclair gravelly sandy loam, 0 to 15 percent slopes	7.5	7.5				
Snohomish silty clay loam		10.5				
Swantown gravelly sandy loam, 0 to 8 percent slopes		10.5				
Swantown gravelly loam, 0 to 8 percent slopes		10.5				
Swantown-Alderwood complex, 0 to 15 percent slopes		10.5				
Tisch silt loam		10.5				
Townsend gravelly loam, 0 to 15 percent slopes	7.5	7.5	5	3	3	
Tukey gravelly loam, 0 to 15 percent slopes	7.5	7.5	5	3	3	
Wapato silty clay loam		10.5				
Whidbey gravelly sandy loam, 0 to 15 percent slopes	7.5	7.5				

[1] A.U.M. stands for animal-unit-month, a term used to express the amount of forage or feed required to maintain one animal unit for a period of 30 days An animal unit is one cow, one horse, one mule, five sheep, or five goats. To convert A.U.M.'s to tons of grass-clover hay, divide A.U.M.'s by 2.5.

5. Using a legume in the cropping system to help maintain or improve fertility.
6. Returning manure to the fields and applying fertilizer if soil tests indicate nutrients should be brought into proper balance.
7. Adding lime as indicated by soil tests.
8. Controlling weeds, diseases, and insects.
9. Using supplemental irrigation.
10. Draining the soil if required.
11. Rotating grazing on pastures.

The estimated yields given in table 2 are not presumed to be the maximum yields attainable. Rather, they are practical goals that can be attained by most farmers. It is recognized that differences in the weather, in the varieties of crops grown, and in the numbers and kinds of insects, diseases, and weeds present cause differences in yields on the same soil. Results of past management experience are also factors. Although the indicated tonnage of hay can be obtained, the weather frequently is such that proper curing does not occur. Rain or high humidity favor molding and loss of the nutritive value of hay left to dry out.

TABLE 3.—*Growth and yield data for fully stocked unmanaged stands of red alder*

Site index	Age	Total merchantable volume per acre			Trees 0.5 inch and larger[1]		
		Trees 5.5 in. in diameter and larger[1]	Trees 9 5 in. in diameter and larger[1]	Trees larger than 9.5 in. in diameter[1] (Scribner rule[2])	Average diameter	Number per acre	Basal area per acre
		Cubic feet	*Cubic feet*	*Board feet*	*Inches*		*Square feet*
60	20	700			4.0	919	80
	30	1,440	70	300	6.1	445	91
	40	1,980	740	3,200	8 0	282	99
	50	2,320	1,250	5,600	9.7	209	107
	60	2,460	1,600	7,500	11.5	157	113
70	20	1,010			4.4	808	85
	30	1,940	570	2,400	6.6	404	97
	40	2,660	1,470	6,500	8.6	265	108
	50	3,190	2,220	10,300	10.4	203	120
	60	3,520	2,800	13,600	12 3	157	129
80	20	1,320			4.8	695	89
	30	2,430	1,070	4,600	7.2	368	104
	40	3,350	2,200	10,000	9.3	247	117
	50	4,060	3,180	15,300	11.2	196	134
	60	4,580	3,990	20,200	13 1	154	144
90	20	1,620	30	100	5.4	674	94
	30	2,930	1,560	6,800	7.8	333	111
	40	4,030	2,940	13,700	10 0	231	127
	50	4,940	4,140	20,600	12.0	184	146
	60	5,640	5,190	27,300	13.9	150	158
100	20	1,930	300	1,200	5.9	512	98
	30	3,420	2,060	9,200	8.5	300	118
	40	4,720	3,660	17,600	10.8	212	136
	50	5,810	5,110	26,200	12 9	172	157
	60	6,710	6,390	34,900	14.7	145	171
110	20	2,240	560	2,400	6 5	441	103
	30	3,920	2,560	11,700	9.2	267	124
	40	5,400	4,400	21,700	11.7	194	144
	50	6,680	6,070	32,100	13.6	165	167
	60	7,770	7,580	42,900	15.5	139	182
120	20	2,540	820	3,500	7.2	376	107
	30	4,410	3,060	14,300	10.0	239	131
	40	6,080	5,130	26,000	12.4	184	153
	50	7,560	7,030	38,400	14 3	156	175
	60	8,830	8,830	51,700	16 3	133	192

[1] Diameter of outside bark and trunk of tree at a point 4.5 feet above ground
[2] Scribner rule, volume of all stems 11 5 inches and larger in diameter at a point 4 5 feet above ground to a top diameter of 8 inches.

Use of the Soils for Woodland[3]

About 95 percent of Jefferson County is woodland. The Federal government owns about 59 percent of this land, the State government 16 percent, and private owners 20 percent. About 5 percent of it is county and Indian land. Coniferous trees cover about 90 percent of the wooded area, and deciduous trees cover about 10 percent. The predominant tree species in the eastern part of the county is Douglas-fir, and the soils of that area are rated for this species. In the western rain forest section of the county, the three dominant species in order of importance are western hemlock, Pacific silver fir, and western redcedar. Four other trees of minor importance, making up about 15 percent of the total cover in the western part of the county, are Sitka spruce, Douglas-fir, red alder, and cottonwood. (See tables 3, 4, and 5). These soils are rated for western hemlock production. Some ratings for red alder timber production have been developed for the soils that formed in alluvium in the river valleys.

Certain soils in the Jefferson County Area produce high-quality minor forest products, mainly floral greenery. Ratings for salal, evergreen huckleberry, and swordfern have been interpreted for these soils and are also presented in this section.

The Olympic National Forest and Olympic National Park are not included in this survey, and their soils are not discussed or rated for timber production.

Soil factors affecting woodland production

Soil properties such as texture, structure, content of organic matter, reaction, aspect, and position all affect tree growth

[3] DAVID L. HINTZ, forestry specialist, Soil Conservation Service, assisted in preparing this section.

TABLE 4.—*Growth and yield data for fully stocked unmanaged stands of western hemlock*

Site index	Age	Total merchantable volume per acre			Trees 0.5 inch and larger[1]		
		Trees 1.5 in. in diameter and larger[1]	Trees 6.5 in. in diameter and larger[1] (International rule)	Trees larger than 11.5 in. in diameter[1] (Scribner rule)	Average diameter	Number per acre	Basal area per acre
		Cubic feet[2]	*Board feet*[3]	*Board feet*[4]	*Inches*		*Square feet*
100	20	840			2.7	3,400	127
	30	2,740	2,000		4.0	2,070	187
	40	4,900	15,000	3,000	6.2	1,150	231
	50	6,900	30,000	13,000	8.6	640	259
	60	8,500	42,000	24,000	10.4	465	276
	70	9,500	53,000	36,000	12.0	375	290
	80	10,400	62,000	46,000	13.2	315	299
110	20	1,130			2.9	3,280	138
	30	3,300	4,000		4.3	1,910	194
	40	5,700	20,000	5,000	6.6	990	237
	50	8,000	36,000	17,000	9.3	570	266
	60	9,600	50,000	32,000	11.2	420	283
	70	10,800	63,000	47,000	12.9	335	297
	80	11,800	74,000	57,000	14.2	280	306
120	20	1,270			3.0	3,160	146
	30	3,800	6,000		4.5	1,780	200
	40	6,300	24,000	6,000	7.0	885	242
	50	9,000	43,000	23,000	9.9	510	272
	60	10,600	59,000	40,000	11.9	375	289
	70	12,100	74,000	55,000	13.7	305	303
	80	13,100	85,000	66,000	15.1	255	312
130	20	1,620			3.1	3,050	151
	30	4,100	8,000		4.7	1,680	204
	40	7,200	28,000	9,000	7.4	810	246
	50	10,000	50,000	28,000	10.5	465	277
	60	11,900	69,000	50,000	12.7	340	295
	70	13,300	84,000	64,000	14.5	275	308
	80	14,500	95,000	76,000	15.9	235	319
140	20	1,900			3.1	2,950	155
	30	4,500	10,000		4.9	1,590	208
	40	7,900	32,000	11,000	7.8	750	250
	50	10,900	56,000	35,000	10.9	430	281
	60	13,100	78,000	58,000	13.3	315	300
	70	14,500	93,000	72,000	15.0	255	312
	80	15,600	104,000	82,000	16.6	215	322
150	20	2,200			3.2	2,860	158
	30	5,200	13,000		5.1	1,520	212
	40	8,500	35,000	14,000	8.1	710	254
	50	11,900	62,000	42,000	11.4	400	285
	60	14,200	87,000	65,000	13.8	295	304
	70	15,800	102,000	81,000	15.7	240	316
	80	17,000	112,000	93,000	17.3	200	327
160	20	2,380			3.3	2,780	160
	30	5,600	14,000		5.2	1,460	215
	40	9,200	39,000	16,000	8.4	670	257
	50	12,700	69,000	47,000	11.7	380	288
	60	15,100	95,000	72,000	14.2	280	306
	70	16,800	111,000	87,000	16.2	225	320
	80	18,000	120,000	100,000	17.9	188	330
170	20	2,600			3.3	2,720	162
	30	6,000	15,000		5.4	1,400	218
	40	9,900	43,000	18,000	8.6	640	259
	50	13,700	76,000	54,000	12.1	365	290
	60	16,100	103,000	79,000	14.6	265	309
	70	17,800	119,000	95,000	16.7	215	323
	80	19,200	128,000	108,000	18.5	180	333

TABLE 4.—*Growth and yield data for fully stocked unmanaged stands of western hemlock*—Continued

Site index	Age	Total merchantable volume per acre			Trees 0.5 inch and larger[1]		
		Trees 1.5 in. in diameter and larger[1]	Trees 6.5 in. in diameter and larger[1] (International rule)	Trees larger than 11.5 in. in diameter[1] (Scribner rule)	Average diameter	Number per acre	Basal area per acre
		Cubic feet[2]	*Board feet*[3]	*Board feet*[4]	*Inches*		*Square feet*
180	20	2,800			3 3	2,660	164
	30	6,400	17,000		5.5	1,360	220
	40	10,600	47,000	20,000	8.9	610	262
	50	14,600	82,000	60,000	12.4	350	293
	60	17,200	111,000	86,000	15 0	255	312
	70	19,000	127,000	101,000	17.2	205	325
	80	20,400	137,000	116,000	19.0	172	336
190	20	3,000			3.4	2,600	166
	30	6,800	19,000		5 6	1,310	222
	40	11,400	51,000	23,000	9 1	585	264
	50	15,500	90,000	66,000	12 7	335	295
	60	18,300	119,000	92,000	15.4	245	315
	70	20,100	135,000	109,000	17.6	195	328
	80	21,600	145,000	123,000	19 5	165	339
200	20	3,200			3.4	2,550	168
	30	7,300	21,000		5.8	1,270	225
	40	12,100	55,000	27,000	9.3	565	266
	50	16,500	97,000	72,000	13.0	325	297
	60	19,300	127,000	100,000	15.7	235	316
	70	21,200	141,000	118,000	17.9	187	330
	80	22,800	152,000	132,000	19.9	158	341

[1] Diameter of outside bark and trunk of tree at a point 4.5 feet above ground.
[2] Stumps and tips included.
[3] International rule: volume of all stems 6 5 inches and larger diameter at a point 4 5 feet above ground to a top diameter of 6 inches.
[4] Scribner rule: volume of all stems 11.5 inches and larger diameter at a point 4.5 feet above ground to a top diameter of 8 inches.

to a degree. Attempts to measure the relative effects of individual soil properties have met with limited success, but the combination of all soil factors has a marked effect on tree growth and management. The woodland interpretations in this report are based on the combined effects of all soil factors.

Tables 3, 4, and 5 show some of the more commonly used woodland production data. In table 6 soils of the Area are rated for their suitability for floral greenery. Other minor forest products, harvested in addition to the evergreen huckleberry, salal, and swordfern rated in this table, are cascara bark, cedar boughs, and small rhododendron shrubs. Management interpretations for woodland groups are presented in table 7. The limitations for use and management given in that table are explained in the paragraphs that follow.

Potential soil productivity (*site index*).—This refers to the capacity of a soil to produce volumes of wood. It is based upon a standard for comparison called the "site index." The site index of Douglas-fir and western hemlock is based on the height the dominant and codominant trees attain at 100 years of age. For red alder, the site index is based on the heights dominant and codominant trees will attain at 50 years of age. To obtain the average site index for a specific tree on a specific soil, the ages and heights of several trees must be taken. Preferably the Douglas-fir and western hemlock will be between 50 and 100 years of age for the site index determination. Determinations for red alder are for stands between 20 and 45 years of age. Site index can be obtained from tables through the use of the average age and height of a specific tree on a specific area or soil. Various tables of site indexes are available (*3, 5, 6, 12*).

Seedling mortality.—Ratings are based on soil-caused mortality for naturally occurring or planted seedlings as follows: *Slight* if expected mortality is 0 to 25 percent, *moderate* if it is between 25 and 50 percent, and *severe* if it is over 50 percent.

Plant competition.—The rating for this limitation is *slight* if competition does not prevent adequate natural regeneration and early growth and does not interfere with adequate development of planted seedlings. The rating is *moderate* if competition delays natural or artificial regeneration and affects both establishment and growth rate but does not prevent the eventual development of fully stocked, normal stands. *Severe* is used when competition can seriously impede natural or artificial regeneration without intense site preparation and maintenance such as seedling and brush control.

Equipment limitations.—The rating for equipment limitations is *slight* if equipment use is not restricted in kind or time of year. It is *moderate* if equipment use is moderately restricted in kind or operations by one or more factors, such as slope, stones or obstructions, seasonal soil wetness, physical soil characteristics, injury to tree roots, and soil structure and stability. It is *severe* if special equipment is needed, and its use is severely restricted by one or more of the items listed for moderate limitation and by safety in operations.

Erosion hazard.—The hazard of erosion is described as *slight* if problems of erosion control are unimportant; *moderate* if some attention must be given to preventing

TABLE 5.—*Growth and yield data for fully stocked unmanaged stands of Douglas-fir (5)*

Site index	Age	Total merchantable volume per acre			Average diameter	Number of trees per acre	Basal area per acre
		Trees 5.5 in. in diameter and larger[1]	International rule	Scribner rule			
		Cubic feet	*Board feet*[2]	*Board feet*[3]	*Inches*		*Square feet*
100	20	100			1.8	4,150	76
	30	800			3.4	1,800	114
	40	1,800			4.9	1,090	143
	50	3,000	1,900	1,600	6 3	764	165
	60	4,300	5,700	4,800	7 6	580	182
	70	5,300	10,600	9,000	8.8	468	197
	80	6,200	16,300	13,900	9.9	394	210
110	20	200			2.2	3,069	81
	30	1,050			3.9	1,472	122
	40	2,350	200	200	5 5	927	153
	50	3,800	3,900	3,500	7 0	659	177
	60	5,200	9,600	8,100	8 5	500	195
	70	6,350	16,500	14,000	9 8	405	211
	80	7,300	23,500	20,100	10.9	345	224
120	20	300			2.6	2,324	86
	30	1,350			4.4	1,219	129
	40	3,000	1,400	1,200	6.1	798	162
	50	4,800	6,500	5,500	7.7	572	187
	60	6,250	14,700	12,500	9.3	439	207
	70	7,500	24,100	20,600	10.8	352	224
	80	8,550	33,100	28,600	12.0	303	238
130	20	400			3.0	1,815	89
	30	1,700			4.9	1,030	135
	40	3,700	3,100	2,600	6.8	680	170
	50	5,600	9,900	8,400	8.5	496	196
	60	7,200	21,100	18,000	10.2	380	217
	70	8,600	32,400	27,900	11.8	310	235
	80	9,700	42,600	37,000	13.1	266	249
140	20	500			3.4	1,460	92
	30	2,100	400	300	5.5	865	140
	40	4,300	5,400	4,500	7.4	585	177
	50	6,350	14,600	12,400	9.3	430	204
	60	8,150	27,800	23,800	11.1	337	226
	70	9,650	40,600	35,200	12 8	274	244
	80	10,850	52,200	45,700	14.3	232	259
150	20	650			3.8	1,210	95
	30	2,500	1,100	900	6.0	735	144
	40	4,900	7,700	6,500	8.0	510	182
	50	7,050	20,000	17,000	10.1	377	210
	60	9,000	34,300	29,600	12.0	296	232
	70	10,550	48,700	42,500	13 8	242	251
	80	11,900	61,100	54,300	15.4	207	266
160	20	800			4.2	1,012	97
	30	2,900	1,800	1,500	6.5	640	147
	40	5,500	10,600	9,000	8.7	445	186
	50	7,700	26,000	22,200	10.9	331	214
	60	9,750	41,700	36,200	12.9	261	237
	70	11,400	57,000	50,000	14.8	214	256
	80	12,850	70,000	62,100	16.6	182	271
170	20	950			4.5	880	98
	30	3,250	3,100	2,600	7.0	555	150
	40	6,000	14,000	11,900	9.4	385	189
	50	8,300	31,800	27,400	11.8	290	217
	60	10,400	49,000	42,800	14.0	228	241
	70	12,150	64,600	57,200	16.0	186	260
	80	13,700	78,400	70,000	17.9	159	276

TABLE 5.—*Growth and yield data for fully stocked unmanaged stands of Douglas-fir (5)*—Continued

Site index	Age	Total merchantable volume per acre			Average diameter	Number of trees per acre	Basal area per acre
		Trees 5.5 in. in diameter and larger[1]	International rule	Scribner rule			
		Cubic feet	*Board feet* [2]	*Board feet* [3]	*Inches*		*Square feet*
180	20	1,100	--	--	4.9	756	99
	30	3,600	4,000	4,000	7 6	483	152
	40	6,400	18,200	15,500	10.2	335	191
	50	8,850	37,700	32,700	12.8	248	220
	60	11,050	56,000	49,300	15.2	195	244
	70	12,850	72,500	64,600	17 5	160	264
	80	14,500	86,700	78,000	19 6	136	280

[1] Volume of all stems more than 5 inches in diameter at a point 4.5 feet above ground to a 4-inch top diameter, inside bark. 90 cubic feet equal 1 cord.
[2] International rule: volume of all stems 11.5 inches and larger in diameter at a point 4.5 feet above ground to a top diameter of 8 inches.
[3] Scribner rule. volume of all stems 11 5 inches and larger in diameter at a point 4 5 feet above ground to a top diameter of 8 inches.

unnecessary soil erosion; and *severe* and *very severe* if intensive treatments, specialized equipment, and special methods of operation must be planned to minimize soil deterioration.

Windthrow hazard.—The hazard of windthrow is *slight* if normally no trees are blown down by the wind. It is *moderate* if some trees are expected to blow down during periods of excessive soil wetness and high wind. The hazard is *severe* if many trees are expected to blow down during periods of soil wetness and moderate or high winds.

TABLE 6.—*Suitability of the soils for floral greenery*

[Only soils that produce significant amounts of high-quality floral greenery are rated]

Soil	Floral greenery		
	Evergreen huckleberry	Salal	Swordfern
Ahl very gravelly loam	Excellent	Good	Good.
Alderwood gravelly sandy loam	Fair	Fair	Good.
Alderwood gravelly loam	Poor	Fair	Good.
Beausite gravelly sandy loam	Good	Good	Fair.
Beausite-Alderwood complex	Fair	Good	Fair.
Beausite-Rock outcrop complex	Fair	Poor	Poor.
Carlsborg gravelly loamy sand	Good	Excellent	Poor.
Cassolary-Kitsap complex	Poor	Fair	Excellent.
Cathcart gravelly silt loam	Fair	Fair	Good.
Clallam gravelly sandy loam	Fair	Good	Poor.
Dabob very gravelly sandy loam	Excellent	Good	Poor.
Dick loamy sand	Fair	Good	Poor.
Everett gravelly sandy loam	Good	Excellent	Poor.
Grove very gravelly sandy loam	Good	Good	Fair.
Hoodsport very gravelly sandy loam	Good	Good	Good.
Hoodsport-Grove very gravelly sandy loams	Good	Good	Fair.
Hoypus gravelly loamy sand	Excellent	Good	Fair.
Hoypus gravelly sandy loam	Excellent	Good	Good.
Indianola loamy sand	Good	Good	Poor
Indianola sandy loam	Good	Good	Fair.
Kitsap gravelly loam	Poor	Fair	Good
Kitsap silt loam	Poor	Poor	Excellent.
Olete very gravelly silt loam	Good	Good	Good.
Olete-Alderwood complex	Fair	Fair	Good.
Olete-Clallam complex	Fair	Good	Fair.
Olete-Hoodsport complex	Good	Good	Good.
Olete-Rock outcrop complex	Fair	Fair	Fair.
Quilcene silt loam	Poor	Poor	Excellent.
Sinclair gravelly sandy loam	Excellent	Excellent	Fair.
Triton very gravelly loam	Fair	Good	Fair.
Tukey gravelly loam	Fair	Fair	Fair.
Whidbey gravelly sandy loam	Good	Good	Fair.

Woodland groups

Similar soils often have essentially the same woodland use and required management. To simplify interpretations, soils that perform similarly as woodland are segregated into woodland groups. Table 7 describes these groups and the rate of production and limitations for woodland use and management of soils within the groups. The woodland group for each mapping unit is shown in the Guide to Mapping Units.

Each woodland group symbol in table 7 consists of three elements, for example, 2d2 and 3f1. The first element of this symbol refers to the productivity of the soils. On this basis the soils have been placed in four of the five classes of the woodland productivity system: class 2, made up of soils of high productivity (site index of 155 to 184); class 3, soils of medium productivity (site index of 125 to 154); class 4, soils of low productivity (site index of 95 to 124); and class 5, soils of very low productivity (site index of less than 95). None of the soils are in class 1, which consists of soils of very high productivity (site index of more than 184).

The second element of the symbol refers to soil characteristics that cause important hazards or limitations in woodland use or management. The soils are in six subclasses, identified as follows: subclass x, if stoniness and rockiness are limitations; subclass w, if wetness is a limitation; subclass d, if a restricted rooting depth is a limitation; subclass s, if sandiness is a limitation; subclass f, if gravel is a limitation; and subclass o, if there are no limitations.

The third element indicates the location of the soils as either (1) in the coastal part of the Area, where western hemlock is the dominant species, or (2) in the eastern part of the Area, where Douglas-fir is the dominant species.

The interpretations in table 7 are derived from original field data and from secondary sources (*6*).

Wildlife

Jefferson County was a virgin wilderness as late as 1846. At that time it was occupied by several tribes of coastal

TABLE 7.—*Management inter-*

[The symbol <

Woodland group	Principal species	Potential production[1]		Management limitations	
		Average site index	Average annual growth	Seedling mortality	Plant competition
			Board feet		
2d2	Douglas-fir, bigleaf maple, western redcedar, grand fir, willow.	155–184	880	Slight	Moderate
2f1	Western hemlock, silver fir, Sitka spruce, red alder, western redcedar.	155–184	1,350	Slight	Moderate
2o1	Western hemlock, Sitka spruce, red alder, western redcedar, bigleaf maple.	155–184	1,350	Slight	Moderate to severe
3w1	Western hemlock, western redcedar, red alder, silver fir, Sitka spruce, bigleaf maple.	125–154	1,030	Moderate to severe	Moderate to severe
3d1	Western hemlock, silver fir, red alder, western redcedar, Sitka spruce, bigleaf maple.	125–154	1,030	Slight	Moderate
3d2	Douglas-fir, western redcedar, red alder, western hemlock, grand fir, bigleaf maple, cherry, madrone.	125–154	570	Slight	Moderate
3f1	Western hemlock, bigleaf maple, Sitka spruce, red alder [2]	125–154	1,030	Slight to moderate	Moderate
3f2	Douglas-fir, western hemlock, grand fir, western redcedar	125–154	570	Moderate to severe	Slight to moderate
3o1	Western hemlock, silver fir, western redcedar, bigleaf maple, Sitka spruce, red alder.[3]	125–154	1,030	Slight	Moderate to severe
3o2	Douglas-fir, red alder, western hemlock, western redcedar	125–154	570	Slight	Moderate
4x2	Douglas-fir, western hemlock, madrone, western redcedar, grand fir, cherry, bigleaf maple, dogwood, willow, silver fir.	95–124	250	Moderate to severe	Slight to moderate
4w1	Western hemlock, western redcedar, Sitka spruce, red alder.	95–124	710	Moderate	Moderate
4w2	Douglas-fir, red alder, western redcedar, grand fir, western hemlock, Sitka spruce, bigleaf maple, willow.	95–124	250	Slight to severe	Moderate to severe
4d1	Western hemlock, red alder, western redcedar, silver fir, bigleaf maple.	95–124	710	Slight	Moderate
4d2	Douglas-fir, western redcedar, red alder, western hemlock, grand fir, cherry, madrone, willow, dogwood.	95 124	250	Moderate	Moderate
4s2	Douglas-fir, western redcedar, red alder, western hemlock, madrone, dogwood.	95–124	250	Slight to moderate	Moderate
4f2	Douglas-fir, western hemlock, red alder, western redcedar, madrone, bigleaf maple, willow.	95–124	250	Moderate	Moderate
5f2	Douglas-fir, madrone, western hemlock, western redcedar	<95	60	Severe	Moderate to severe

[1] Values for average site index and average annual growth are for the first species listed in the principal species column. They are, in all cases, either for Douglas-fir (*5*) or western hemlock (*3*).

Indians whose only contact with white civilization came from occasional visits with fur traders. Wildlife of many kinds was abundant and included game fish, shellfish, waterfowl, upland game birds, and many large and small mammals. Salmon, cod, halibut, and other significant food fish inhabited the marine waters adjacent to county boundaries. An abundance of marine crabs, clams, oysters, and other shellfish were on the many beaches and tidelands. Waterfowl that frequent coastal marshes, sloughs, ponds, and lakes during fall and winter months include the Canadian, black brant, snow geese, and many kinds of ducks, the most common of which are the mallard, widgeon, pintail, goldeneye, harlequin, scaup, teal, and common merganser.

Trout, steelhead, and salmon were plentiful in larger streams and rivers and lakes teemed with several species of trout. Black-tailed deer, black bear, elk, and cougar were plentiful. Common smaller mammals were the beaver, bobcat, coyote, red fox, marmot, marten, mink, moutain beaver, river otter, muskrat, spotted and striped skunk, snowshoe hare, weasel, and several species of squirrels and chipmunks. Upland game birds included band-tailed pigeon, mountain quail, and blue and ruffed grouse.

Osprey and bald eagle were common along the coastal areas, as were other birds of prey, such as the Cooper's hawk, goshawk, peregrine falcon, red-tailed hawk, sharp-shinned hawk, and great horned owl.

During the past 125 years of settlement and civilization many changes in wildlife populations have occurred. Commercial and sport fishing and habitat alteration have greatly depleted salmon populations. Trout in the more accessible lakes are kept at a relatively high level through regular restocking by the State Department of Game. Some trout restocking, mostly of rainbow trout, in streams and rivers is currently being accomplished, but it is often inadequate to meet the requirements of increased fishing. Steelhead are still quite plentiful in larger streams and rivers, thanks to an ever-increasing restocking program and public demand.

Shellfish of all kinds are still plentiful along most of the same beaches where they formerly abounded. Most of the good clam beaches and oyster tidal flats, however, are

pretations of woodland groups

means less than]

Management limitations—Continued			Understory plants
Equipment limitation	Erosion hazard	Windthrow hazard	
Moderate to severe	Slight to severe	Moderate	Swordfern, red elderberry, thimbleberry, vine maple, salal, red huckleberry, devilsclub, salmonberry.
Slight to severe	Slight to very severe	Moderate	Salal, red huckleberry, blue huckleberry, trailing blackberry, swordfern, deerfern, vine maple.
Slight	Slight	Slight	Vine maple, salmonberry, swordfern, deerfern, red huckleberry, blue huckleberry, cascara, willow, devilsclub.
Moderate to severe	Slight	Moderate to severe	Swordfern, deerfern, salmonberry, wild plum, devilsclub, salal, red huckleberry, blue huckleberry, tussock.
Moderate to severe	Slight to severe	Moderate	Swordfern, deerfern, red huckleberry, blue huckleberry, vine maple, cascara, salal, red elderberry, elk sedge.
Moderate to severe	Slight to very severe	Moderate	Salal, evergreen huckleberry, salmonberry, thimbleberry, trailing blackberry, red huckleberry, Oregon grape, red elderberry, nettles, bracken, swordfern.
Slight to severe	Moderate to very severe.	Slight to moderate	Salal, salmonberry, evergreen huckleberry.
Slight to moderate	Slight to moderate	Slight	Oregon grape, trailing blackberry, salal, bracken
Slight to severe	Slight to moderate	Slight to moderate	Vine maple, salmonberry, salal, red elderberry, swordfern, deerfern, devilsclub, trailing blackberry.
Slight to moderate	Slight to severe	Slight	Oregon grape, swordfern, red huckleberry, trailing blackberry, bracken.
Moderate to severe	Severe to very severe	Moderate	Salal, Oregon grape, ocean spray, vine maple, rhododendron, cascara, swordfern, bracken, trailing blackberry, red huckleberry, evergreen huckleberry.
Severe	Slight	Severe	Salmonberry, swordfern, salal, skunkcabbage, reeds, rushes.
Moderate to severe	Slight to moderate	Moderate to severe	Sedges, reeds, nettles, skunkcabbage, salmonberry.
Severe	Severe to very severe	Moderate	Cascara, red elderberry, salal, salmonberry, swordfern, deerfern, vine maple, devilsclub, red huckleberry, blue huckleberry.
Slight to moderate	Slight to very severe	Moderate	Oregon grape, salal, evergreen huckleberry, bracken, swordfern.
Slight to moderate	Slight to moderate	Slight	Oregon grape, salal, evergreen huckleberry, trailing blackberry.
Slight to severe	Slight to severe	Slight	Oregon grape, salal, rhododendron, ocean spray, bracken, evergreen huckleberry.
Slight	Slight to severe	Slight to moderate	Oregon grape, trailing blackberry, rhododendron, bracken, evergreen huckleberry, salal.

[2] Red alder in this woodland group has a site index of 125 to 154 and an average annual growth of 60 cubic feet.
[3] Red alder in this woodland group has a site index of more than 185 and an average annual growth of 150 cubic feet.

privately owned. These shellfish are steadily declining in areas available to the public.

Development of about 21,000 acres of farmland in eastern Jefferson County and about 5,000 acres in western Jefferson County, along with the continual logging, has changed the habitat and population densities of many native animals. Cleared or logged-over lands have increased food supplies for upland birds, elk, and deer, and depleted it for other animals. This is particularly true for bear and cougar.

Deer inhabit every section of the Jefferson County Area. Heaviest deer populations occur in lowland areas below elevations of 500 feet, either in the vicinity of farmlands or in the southern part of eastern Jefferson County on Bolton and Coyle peninsulas, and in the Thorndyke Bay area. Deer are generally quite plentiful in these areas but have declined somewhat in recent years because of increased hunting.

Roosevelt elk frequent the rain forest country of western Jefferson County. They have increased in number during the past 20 to 25 years since clear-cut logging operations began. Newly logged areas produce more of the elk's favorite types of browse food. The pressure of greatly increased hunting in recent years has scattered many of the larger herds and driven many back into more inaccessible wilderness areas. Herds of 75 to 125 elk are seldom seen. The vast unpopulated wilderness of this area, however, most of which is State land, will very likely ensure a good elk population for many years.

Bear, bobcat, cougar, red fox, fisher, marten, mink, and raccoon are still quite plentiful in both eastern and western Jefferson County. Cougar and bear are more plentiful in western Jefferson County, where there is more food available. Coyote, bobcat, and fox are more numerous in eastern Jefferson County. Here they are generally either within a few miles of lowland farmland, where both domestic and wild birds are plentiful, or in the mountain foothills, where grouse, mountain beaver, and snowshoe hare are numerous.

Both marine and river otter, once plentiful, are now scarce and found principally along the coast. Beaver, muskrat, raccoon, and mink are plentiful throughout the Area, especially beaver and muskrat, which live along most streams,

rivers, and lakes. Mountain beaver are very plentiful in wooded areas of eastern Jefferson County, at elevations of about 100 to 1,000 feet. Native Olympic whistling marmot and mountain goat were introduced into the Olympic Mountains about 40 years ago. These and the migrating summer elk herds are commonly seen during the summer in the National Forest and National Park at elevations above 4,000 feet. Limited hunting of mountain goats has been allowed during the last few years.

Several species of squirrel and chipmunks are in most areas from sea level to timberline, particularly in the eastern part of the Jefferson County Area. Osprey and bald eagle are now nearing extinction. Other birds of prey are still fairly common.

Each mapping unit in the Area has some potential for providing food and cover for some species of wildlife. Some soils are better suited to supporting grasses, sedges, and succulent plants. Others are better suited to growing hardwoods and deciduous shrubs. Still others support mainly thick stands of conifers. Whatever the soils and wherever they occur in relation to topography, climate, or plant and animal ecology, they complement each other in supplying food and shelter for wildlife.

Wildlife groups

Each of the ten soil associations in the survey area is a combination of topographic features, soils, and plant species that is suitable for several species of wildlife. In this section each association is described as a group of soils suitable for use as habitat for specific species of wildlife. The more important species of wildlife and some general suggestions for wildlife management are described for each of the ten wildlife groups.

WILDLIFE GROUP 1

This wildlife group consists of soils of the Triton-Hoodsport association. This association provides a year-round source of food and cover for many kinds of wildlife and provides seasonal cover for many other kinds of wildlife. Blue grouse, ruffed grouse, band-tailed pigeon, bear, bobcat, cougar, deer, fox, mountain beaver, mink, snowshoe hare, squirrel, and chipmunk are permanent residents. The mountain foothills, most of which are wilderness areas, provide a seasonal source of food and cover for migrating elk, band-tailed pigeons, and various species of summer-resident ducks, such as mallard, harlequin, ruddy, and wood ducks. This group is traversed by several large rivers and many small streams that provide good steelhead fishing and fair rainbow and cutthroat trout fishing. The many miles of marine coast along Hood Canal provide fair salmon fishing throughout the year.

WILDLIFE GROUP 2

This wildlife group consists of soils of the Quilcene-Alderwood-Cathcart association. Except for elk, wildlife of this association is the same as those listed in the introduction to this section. Mallard, scaup, and pintail ducks, and brant and Canadian geese frequent the small coastal area at the head of Quilcene Bay in the fall. Harlequin, ruddy, wood, and mallard ducks frequent several small streams and ponds in this group and raise their young. Deer are the most abundant of the larger game animals.

Most of this area is covered with natural forest vegetation.

WILDLIFE GROUP 3

This wildlife group consists of soils of the Clallam-Hoypus-Dick association. Most of the wildlife species common to Jefferson County occur in this association, especially mammals, waterfowl, and upland game birds. Quail and pheasant are more abundant in and around cleared areas of farmland. Ruffed grouse and a few other species of grouse are on the west side of Discovery Bay. Most common species of ducks frequent the many miles of coastal waters, particularly those around Port Townsend and Discovery Bay. Bald eagle and osprey, although rare, are seen occasionally along these shores. Deer are common, except in the populated area of Port Townsend. The heaviest deer population is on the west side of Discovery Bay. Bear, cougar, coyote, and bobcat are also common on these soils. The largest stream flowing through this association is Chimacum Creek. It produces some rainbow and cutthroat trout and attracts migratory ducks in the fall.

About two-thirds of the area is still under native forest vegetation. This area has the lowest rainfall of any of the associations, and the water supply during the dry summer months is not adequate for some species of wildlife. Adding stock ponds or other watering places and growing more small-grain crops, especially in the drier northern part of Quimper Peninsula, helps to attract pheasants and ducks.

WILDLIFE GROUP 4

This wildlife group consists of soils of the Semiahmoo-McMurray-Mukilteo association. Wildlife in this association is strikingly different from that in the other associations. Although the association is small, it includes a greater number of upland game birds, as well as ducks and geese, than most other associations. The State Game Department plants several hundred pheasant in these valleys each summer. An abundance of food and cover is available for these game birds. Besides the waters of Chimacum Creek, this association has many natural and artificial ponds that attract and provide food for waterfowl. Brushy pastures and fence rows, small patches of woods, numerous home garden plots, scattered small grain fields, and extensive pasture lands provide excellent food and cover for the upland game birds. This abundance of bird life naturally attracts many predators. Birds of prey include red-tailed, Cooper's, and sharp-shinned hawks. Predatory mammals include coyote, red fox, mink, raccoon, and striped skunk. Other mammals are beaver, a large number of muskrat, and a few deer and bear. Game fish are not important in areas of this association. Chimacum Creek produces a few native rainbow and cutthroat trout, and many ranch ponds are stocked with rainbow trout.

WILDLIFE GROUP 5

This wildlife group consists of soils of the Alderwood-Sinclair association. This association includes a great variety of soils, topography, and wildlife. Many species of upland game birds and birds of prey frequent the valleys and rolling uplands. These include pheasant, quail, pigeon, and ruffed grouse. Cooper's, red-tailed, and sharp-shinned hawks frequent the uplands, and bald eagle and osprey are sometimes observed along the coastal waters. All of the waterfowl and game fish mentioned in the introduction to this section occur either along the coastal bays and inlets or in the inland streams, lakes, and swamps. Except for elk, all the common mammals described in the introduction as inhabiting

eastern Jefferson County also inhabit this largest of the eastern Jefferson County associations.

A large part of this association is under forest vegetative cover and provides an ample supply of food, water, and cover for the wildlife that live there Upland game birds, especially quail and pheasant, can be increased in the farmland areas by providing additional brush cover. Fall and winter waterfowl populations can be increased by constructing stock ponds and planting such food as smartweed, peas, and barley.

WILDLIFE GROUP 6

This wildlife group consists of soils of the Olete-Hoodsport association Most of this association, especially the northern part, is rugged wilderness terrain covered with native vegetation. It provides abundant water, food, and cover. Deer, bear, cougar, blue grouse, and ruffed grouse are plentiful. Elk are sometimes seen along the fringes of the National Park and National Forest. Quail and pheasant are in the farming areas of the Quilcene Valley. Waterfowl are fairly abundant along the two miles of shallow coastal shoreline near Quilcene. Summer-resident harlequin, wood, mallard, and ruddy ducks nest along several small streams and ponds. These ponds contain rainbow, cutthroat, and brook trout.

WILDLIFE GROUP 7

This wildlife group consists of soils of the Whidbey-Dick association. This association is made up of Indian and Marrowstone Islands. It is in a belt of low rainfall. Indian Island is owned and controlled by the Federal government and is maintained as a wildlife sanctuary. The deer there have few natural enimies and have an abundance of food, water, and cover. Consequently, they have increased in numbers. Some of these migrate across the causeway or swim the narrow channel to Marrowstone Island. Hunting by special permit helps to maintain a deer population the island can support.

In the past Marrowstone Island supported most of the species of wildlife common to the lowland area of eastern Jefferson County. In recent years, however, many persons have purchased small acreages on the island for homesites and moved into the area. At present about 25 percent of the island is perennial grass pasture, and the rest is either home and garden sites or small wooded areas This change has resulted in an increase in the number of quail, pheasants, and ruffed grouse and a decrease in the numbers of large wild animals.

WILDLIFE GROUP 8

This wildlife group consists of soils of the Dimal-Solleks-Snahopish association and the Hoko-Klone-Calawah association. Elevation ranges from slightly above sea level to about 3,500 feet. The spread in elevation causes migrations of some bird and mammal wildlife because of seasonal variations in food supply.

All of the various species of wildlife mentioned for western Jefferson County in the introduction to this section are present in these areas. The same species of wildlife utilize the food supplies at all elevations, either seasonally or on a permanent basis. Black bear, cougar, deer, and elk migrate freely. Heavy winter snows at elevations above 2,000 feet drive most of these mammals to lower elevations during winter months. During the elk hunting season, herds of elk that have migrated into the lowlands, where food is more abundant, are driven temporarily back into the uplands to escape the hunters.

Small mammals such as the coyote, bobcat, fisher, fox, marten, mink, and raccoon also inhabit areas of both associations, but the predators migrate from the lower to the higher elevations much more than the others. Beaver, muskrat, skunk, raccoon, rabbit, and river otter generally inhabit only areas at lower elevations.

Several species of ducks frequent the rivers and streams as summer residents in areas of both associations. These include the harlequin, mallard, merganser, ruddy, and wood ducks. Geese are seldom seen in these areas. Such birds of prey as the peregrine falcon, several species of hawks, and the bald eagle and osprey are at all elevations. The latter two, though scarce, are generally at lower elevations along the coast where fish are more plentiful. Game birds, principally band-tailed pigeon, blue grouse, and ruffed grouse, are widespread. The blue grouse, however, is present more consistently in areas above 1,500 feet.

Trout, steelhead, and salmon are plentiful along the coast, particularly steelhead and salmon. Steelhead and salmon, particularly the pink and chum salmon, migrate short distances up many of the smaller streams. Native trout are not plentiful in the streams, which are not artificially stocked.

WILDLIFE GROUP 9

This wildlife group consists of soils of the Queets-Kalaloch-Huel association. In areas of this association are a great variety of wildlife of all kinds. The rich soils that formed in alluvium along the larger river valleys provide food, water, and cover, either directly or indirectly, for most species of birds and mammals. Bear, cougar, deer, and elk frequent these bottom lands, both seasonally and all year round. Most of the smaller mammals common to western Jefferson County also are present in areas of this group of soils. Some found more abundantly here than on the upland are beaver, river otter, fisher, raccoon, and skunk.

The larger river bottom lands support a much larger waterfowl population in fall, winter, and summer than the other two western Jefferson County associations. The number of migratory wintering ducks and geese, however, is not nearly as great as that in the eastern Jefferson County Area. Summer ducks often seen include mallard, merganser, harlequin, ruddy, and wood ducks. Game birds include large numbers of band-tailed pigeons and ruffed grouse. Bald eagle and osprey, though rare, are often seen in areas of this association, particularly in and around the mouths of the large rivers. Marsh hawk, peregrine falcon, Cooper's hawk, and great horned owl are the more common birds of prey.

Several species of salmon and steelhead, along with the sea-run cutthroat trout, are plentiful in season in the larger rivers The Hoh and Queets Indians, living in small reservations along the mouths of these rivers, catch a large percentage of the migrating salmon and many steelhead. Native rainbow trout are scarce in these rivers, but sea-run cutthroat fishing, 5 to 20 miles inland, is good during July and August.

Engineering Uses of the Soils[4]

This section is useful to those who need information about soils used as structural material or as foundation upon which

[4] GLEN H. HOUGH, agricultural engineer, Soil Conservation Service, assisted in preparing this section.

structures are built Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, shear strength, compaction characteristics, soil drainage, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. Data on these properties are presented in tables 8 and 9. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who:

1. Make soil and land use studies that can aid in selecting and developing residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Locate probable sources of gravel, sand, and other material suitable for construction needs.
4. Make preliminary estimates of engineering properties of soils in the planning of farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 8 and 9, which show, respectively, several estimated soil properties significant in engineering and interpretations for various engineering uses.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 8 and 9, and it can be used to make other useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables. Also, inspection of sites, especially small ones, is needed because many delineated areas of a given mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for engineering.

Some of the terms used in this soil survey have special meaning to soil scientists, not known to all engineers. The Glossary defines many of these terms.

Engineering soil classification systems

The two systems most commonly used in classifying soils for engineering are the Unified system (*11*) used by the SCS engineers, the Department of Defense, and others, and the AASHO system (*1*) adopted by the American Association of State Highway Officials.

In the Unified system soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content. Soils are grouped in 15 classes. These include eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, CL-ML.

The Unified system is used to classify soils according to those properties that affect use of the soils as foundation material and for construction purposes other than highway construction and maintenance.

The AASHO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups, ranging from A-1 through A-7, on the basis of grain-size distribution, liquid limit, and plasticity index. In group A-1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A-7, are clay soils that have low strength when wet and are the poorest soils for subgrade. The AASHO and Unified classifications are shown in table 8.

USDA texture is determined by the relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. "Sand," "silt," "clay," and some of the other terms used in the USDA textural classifications are defined in the Glossary.

Soil properties significant in engineering

Estimated soil properties significant in engineering are given in table 8. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 8.

Depth to bedrock is the distance from the surface of the soil to the upper surface of the underlying rock layer.

Depth to seasonal high water table is the distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Soil texture is described in table 8 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains significant amounts of gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of soil characteristics observed in the field. The estimates in table 8 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is the relative change in volume to

be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils causes much damage to building foundations, roads, and other structures. A high shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Corrosivity, as used in table 8, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil properties such as drainage, texture, total acidity, and electrical conductivity of the soil material. Corrosivity for concrete is influenced mainly by the content of sodium or magnesium sulfate, but also by soil texture and acidity. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of low means that there is a low probability of soil-induced corrosion damage. A rating of high means that there is a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Frost-action potential, as used in table 8, pertains to damage caused by formation of ice lenses and associated expansion in the soil and subsequent thawing. Frost heave is particularly damaging to highway and airfield pavements, driveways, patios, and sidewalks. It is less severe for dwellings and buildings because footings usually extend below the depth of frost penetration. Thawing causes collapse of surface elevation and provides excess free water, which lowers the strength of the soil. Soil temperature, soil moisture, and grain size distribution are the three most important properties affecting frost action. Most of the soils of the Area lack sufficient soil moisture and sufficiently cold temperatures to be a problem. Soils with winter high water tables have sufficient water available for the formation of thin ice lenses. These are rated as having a slight frost-action potential.

Engineering interpretations of soils

The interpretations in table 9 are based on the engineering properties of soils shown in table 9, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of the Jefferson County Area. In table 9 ratings are used to summarize limitation or suitability of the soils for all listed purposes other than for ponds and reservoirs and embankments. For those particular uses, table 9 lists those soil features not to be overlooked in planning, installation, and maintenance.

Soil limitations are indicated by the ratings *slight, moderate,* and *severe. Slight* means soil properties are generally favorable for the rated use, or that limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means soil properties are so unfavorable and so difficult to correct or overcome that major soil reclamation, special designs, or intensive maintenance are required.

Soil suitability is rated by the terms *good, fair,* and *poor,* which have, respectively, meanings approximately parallel to the terms, *slight, moderate,* and *severe.* Explanations of the columns in table 9 are given in the paragraphs that follow.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. In addition to ease of working and spreading the soil material, suitability (in terms of preparing a seedbed) is based on natural fertility of the material or the response of plants when fertilizer is applied and the absence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that also affect suitability. Also considered in the ratings is damage that will result to the area from which topsoil is taken.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 9 provide guidance about where to look for probable sources. A soil rated as a good or fair source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect mining of the materials, and neither do they indicate quality of the deposit.

Road fill is soil material used in embankments for roads. The suitability ratings reflect the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage. They also reflect the relative ease of excavating the material at borrow areas.

Septic-tank filter fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material between depths of 18 inches and 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope is a soil property that affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor and has sides, or embankments, of compacted soil material. The assumption is made that the embankment is compacted to medium density and the pond is protected from flooding. Properties are considered that affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic matter, and slope. If the floor needs to be leveled, depth to bedrock becomes important. The soil properties that affect the embankment are the engineering properties of the embankment material, as interpreted from the Unified classification, and the amount of stones, if any, that influence the ease of excavation and compaction of the embankment material

Local roads and streets, as rated in table 9, have an all-weather surface expected to carry year-round automobile traffic. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep.

Soil properties that have the most effect on design and construction of roads and streets are the load-supporting

TABLE 8.—*Estimated soil prop-*

[An asterisk in the first column indicates that at least one mapping unit in that series is made up of two or more kinds of soil. The soils in such other series that appear in the first column of this table Absence of data indicates that

Soil series and map symbols	Depth to—		Depth from surface of typical profile [1]	USDA texture	Classification		Coarse fraction greater than 3 inches
	Bedrock [1]	Seasonal high water table [1]			Unified	AASHO	
	Inches	*Feet*	*Inches*				*Percent*
Agnew: AgB, AgE	>60	1–2	0–9	Silt loam	ML or CL	A-4	
			9–52	Silty clay loam	CL	A-7	
			52–60	Gravelly silty clay loam.	CL	A-7	
*Ahl: AhF, AkF Rock outcrop part of AkF too variable for valid estimates	24–40	>5	0–30 30	Very gravelly loam Basalt.	GM, SM	A-1 or A-2	0 20
*Alderwood:							
AlC, AlD, AlE, AuC For Quilcene part of AuC, see Quilcene series.	>60	[2] 2–3	0–30 30–48	Gravelly sandy loam Weakly cemented and very compact gravelly sandy loam, glacial till.	SM GM or SM	A-1 or A-2 A-1 or A-2	10–25 0–25
AmC, AmD	>60	[2] 2–3	0–33 33–45	Gravelly loam Weakly cemented and very compact gravelly loam, glacial till.	GM GM or SM	A-4 A-2 or A-1	0–20 0–25
*Beausite:							
BaD, BaE, BdD, BdE, BeE For Alderwood part of BdD, see Alderwood series, unit AlC. For Alderwood part of BdE, see Alderwood series, unit AlE. Rock outcrop part of BeE too variable for valid estimates.	20–36	>5	0–33 33	Gravelly sandy loam and very gravelly sandy loam. Sandstone conglomerate.	SM	A-1 or A-2	25–35
Belfast:							
Bf	>60	[3] >5	0–60	Stratified sandy loam, sandy loam, and loam with sand, pebbles, and cobbles.	SM or ML	A-4	0–20
Bg	>60	[3] >5	0–60	Stratified silt loam, fine sandy loam, and loam.	ML	A-4	100
Bh	>60	[3] 2–4	0–60	Stratified silt loam and silty clay loam.	ML or CL	A-4 or A-6	100
Bk	>60	[3] ½–1	0–60	Stratified silt loam, fine sandy loam, loam and clay loam.	ML or CL	A-4 or A-6	100
Bm	>60	[3] ½–1	0–20	Silty clay loam and sandy clay loam.	CL	A-6	0
			20–60	Stratified silt loam, fine sandy loam, and clay loam.	SM or ML	A-4	0
*Calawah: CGB, CND, CVB For Snahopish part of CND, see Snahopish series, unit SPD For Tealwhit part of CVB, see Tealwhit series, unit TEB.	>60	2–3	0–40	Silt loam and silty clay loam.	ML or CL	A-4 or A-6	0
			40–60	Heavy silty clay loam and silty clay.	CL	A-7	0
Carlsborg: CaC, CaD	>60	>5	0–60	Gravelly loamy sand	SM	A-1 or A-2	0–10
Casey:							
CdB	>60	1–2	0–17 17–60	Fine sandy loam Clay (with thin layer of loamy fine sand).	SM CH	A-4 A-7	0 0

erties significant in engineering

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to the soil is too variable or that no estimate was made. > means more than, <, less than]

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity to—		Frost-action potential
No. 4 (4.7 mm)	No. 10 (2 0 mm)	No. 40 (0.42 mm)	No 200 (0.074 mm)					Uncoated steel	Concrete	
				Inches per hour	*Inches per inch of soil*	*pH*				
100	100	90–100	70–80	0 6–2.0	0 16–0.18	5.6 6.5	Low or moderate.	High	Moderate	Slight.
100	100	90–100	80–90	0 2-0.6	0.18-0.20	6.1–6.5	Moderate	High	Low.	
80–90	75 85	70–80	60–70	0.2–0.6	0.15–0.17	6.6–7.3	Moderate	High	Low.	
40–60	30–40	20–35	15–25	0.6–2.0	0.08–0.10	5.6–6.5	Low	Moderate	Moderate	None.
60–70	55–65	25–35	20–30	2 0–6.0	0 07–0.09	5 6–6.5	Low	Moderate	Moderate	Slight.
40–70	35 65	20–45	10–30	<0.06			Low	Moderate	Moderate.	
60 70	55–65	45–55	35–45	0 6–2.0	0.12–0.14	6.1–6.5	Low	Moderate	Low	Slight.
40–70	35–65	30–55	20 35	<0 06			Low	Moderate	Low.	
60–70	50–65	25–35	15–25	2.0–6.0	0.06 0.08	5 6–6.5	Low	Moderate	Moderate	None.
80–100	70–100	65–80	35–65	0.6–2.0	0.12–0.14	5.6–6 5	Low	Moderate	Moderate	None.
100	100	70–85	50–80	0.6–2 0	0 15–0.17	5.6–6 5	Low	Moderate	Low or moderate.	None.
95–100	90 100	80–90	70–85	0 2–0.6	0.19–0 21	6.1–7.3	Low or moderate.	Moderate	Low	Slight.
100	90 -100	60–75	50–70	0.2–0 6	0.18–0.20	6.1–7.3	Low or moderate.	High	Low	Slight.
100	95 100	85–90	55–85	0.2–0 6	0 17–0 19	6.1–7.3	Moderate	High	Low	Slight.
100	95–100	70–85	45–65	0.6–2 0	0.14–0.16	6.1–7.3	Low	High	Low.	
100	100	95–100	80–95	0.2–0 6	0 17–0.20	4.5–5 0	Low or moderate.	High	High	Slight.
100	100	95 100	85–95	0 06–0.2	0 18–0 20	4.5–5.0	Moderate	High	High.	
70–80	45–55	30 40	10–20	6 0–20.0	0.05–0.07	5.6–6 5	Low	Moderate	Moderate	None.
100	100	65–80	35–50	0 6–2 0	0 13–0 15	6 1–6.5	Low	High	Low	Slight.
100	100	90–100	80–85	<0 06	0 14–0.16	6.6–7.3	High	High	Low.	

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface of typical profile [1]	USDA texture	Classification		Coarse fraction greater than 3 inches
	Bedrock [1]	Seasonal high water table [1]			Unified	AASHO	
	Inches	*Feet*	*Inches*				*Percent*
Casey:—Continued							
CeB	>60	1–2	0–17	Silt loam and loam	ML or CL	A-4 or A-6	0
			17–60	Clay (with thin layer of loamy fine sand).	CH	A-7	0
*Cassolary: CfC, CfD, CfE, ChC, ChD, CkC, CkD, CkE. For Everett parts of ChC and ChD, see Everett series, units EvC and EvD. For Kitsap parts of CkC, CkD, and CkE, see Kitsap series, units KtC, KtD, and KtE.	>60	>5	0–23	Sandy loam	SM	A-2	0
			23–38	Silt loam and silty clay loam.	CL	A-6	0
			38–60	Stratified fine sandy loam and medium sand.	SM	A-4 or A-2	0
Cathcart: ClC, ClD, ClE	24–40	>5	0–38	Gravelly silt loam and gravelly loam.	SM	A-2 or A-4	0–5
			38	Sandstone bedrock			
Clallam: CmC, CmD	>60	>5	0–23	Gravelly sandy loam	SM	A-2	5–10
			23–36	Weakly cemented, very compact gravelly sandy loam glacial till.	GM or SM	A-1 or A-2	0–25
Coastal beaches: Co, CW. Too variable for valid estimates.							
Cut and fill land: Cu. Too variable for valid estimates.							
Dabob: DaC, DaD	>60	[2] 1½–3	0–29	Very gravelly sandy loam.	GM	A-1	20–30
			29–33	Weakly cemented, very compact, gravelly sandy loam glacial till.	GM-SM	A-1 or A-2	0–25
Dick: DcC	>60	>5	0–60	Loamy sand	SM	A-2	0
Dimal: DMF	10–20	>5	0–16	Very flaggy silty clay loam.	GC	A-2	65–90
			16	Shale and sandstone bedrock.			
Everett: EvC, EvD, EvE	>60	>5	0–26	Gravelly sandy loam and gravelly loamy sand.	GM or GP-GM	A-1	0–15
			26–60	Very gravelly sand	GP	A-1	0–15
Grove: GoC, GoD, GoE	>60	>5	0–60	Very gravelly loamy sand and very gravelly coarse sand.	GP or GP-GM	A-1	0–20
GrC, GrD	>60	>5	0–30	Very gravelly sandy loam and gravelly sand.	GM or GM-GP	A-1	15–25
			30–40	Weakly cemented very gravelly loamy sand.	GP-GM	A-1	15–25
			40–60	Very gravelly sand	GP	A-1	0–20

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Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity to—		Frost-action potential
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete	
				Inches per hour	*Inches per inch of soil*	*pH*				
95–100	95–100	75 90	65–85	0.6-2.0	0.16–0.20	6 1–6.5	Low or moderate.	High	Low	Slight.
100	100	90–100	75–85	0.06–0.2	0.14–0.16	6.6–7.3	High	High	Low	
90–100	75–90	55–75	25 35	2.0-6.0	0.11–0.13	5.1–6.0	Low	High	Moderate	None.
100	100	85–95	80–90	0.2–0.6	0.19–0.21	5.6–6.5	Moderate	Moderate	Moderate	
100	95–100	65–75	30–40	2.0–6.0	0.09–0.11	6.1–7.0	Low	Low	Moderate	
55–70	40–50	35–50	30–40	0.6–2.0	0.13–0.15	5.1–6.0	Low	High	Moderate	None.
75–85	45–55	30–40	15–25	0.6 2 0	0.07 0.09	5.1–6.0	Low	Moderate	Moderate	None.
40–70	35–65	20–45	10–30	<0.06			Low	Moderate	Moderate	
30–45	25–40	20–35	10–20	2.0–6.3	0.05–0.07	5.1 6.5	Low	Moderate	Moderate	Slight.
40–70	35–65	20–45	10–30	<0.06		6.1–6.5	Low	Moderate	Moderate	
95–100	95–100	50–75	15–30	6.0–20.0	0.07–0.09	5 6–7.0	Low	Low	Low	None.
10–35	10–35	10–35	10–30	0.6 2 0	0.08 0 10	4.5–6.0	Low	Moderate	Moderate	None.
30–55	25–50	20–35	5–20	6.0 20.0	0.06 0.08	5 6–6.5	Low	Moderate	Moderate	None.
30–40	25–35	20–30	0–5	6.0–20.0	0.03–0.05	6.1–6.5	Low	Low	Moderate	
30–40	25–35	10–20	0–10	>20.0	0 04–0.06	5.6–6 5	Low	Moderate	Moderate	None.
35–50	30–45	25 40	5–20	2.0 6.0	0.07–0.09	5.6–6.0	Low	Moderate	Moderate	None.
35–50	30–45	25–40	5–10	<0.2		6.1–6.5	Low	Low	Moderate	
30–40	25–35	15–25	0 5	>20.0	0.03–0 05	6.1–6.5	Low	Low	Moderate	

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface of typical profile [1]	USDA texture	Classification		Coarse fraction greater than 3 inches
	Bedrock [1]	Seasonal high water table [1]			Unified	AASHO	
	Inches	*Feet*	*Inches*				*Percent*
Hoh:							
HF	>60	[3] >5	0–36	Fine sandy loam and sandy loam.	SM	A-4	0
			36–60	Very gravelly coarse sand.	GP	A-1	5–15
HH	>60	[3] >5	0–36	Silt loam, very fine sandy loam, and fine sandy loam.	ML	A-4	0
			36–60	Very gravelly coarse sand.	GP	A-1	5–15
*Hoko:							
HKC, HKD, HKE, HLE, HMC. For Snahopish part of HLE, see Snahopish series, unit SPD. For Tealwhit part of HMC, see Tealwhit series, unit TEB.	>60	[2] 1½–3	0–29	Gravelly silt loam and gravelly silty clay loam.	ML or CL	A-4 or A-6	5–15
			29–40	Weakly cemented, very compact gravelly silty clay loam glacial till.	GC or CL	A-4 or A-6	0–25
HNB	>60	[2] ½–1	0–20	Gravelly silt loam, gravelly silty clay loam, and cobbly clay loam.	ML or CL	A-4 or A-6	5–15
			20–25	Weakly cemented, very compact cobbly clay loam glacial till.	ML or CL	A-4 or A-6	20–40
*Hoodsport HoC, HoD, HpC, HrD. For Grove part of HrD, see Grove series, unit GoD.	[4] 20–36	[2] 2–3	0–28	Very gravelly sandy loam and gravelly loam.	GM or GM-GP	A-1	20–30
			28–45	Weakly cemented, very compact, gravelly sandy loam glacial till.	GM	A-1	0–25
Hoypus: HuC, HuD, HuE, HvC	>60	>5	0–60	Gravelly or very gravelly sand and loamy sand (gravelly sandy loam surface layer in places).	GW-GM or GM	A-1	0
Huel: HW	>60	[3] 3–5	0–22	Loamy fine sand and fine sandy loam.	SM	A-2	0
			22–60	Very gravelly and cobbly loamy sand and coarse sand.	GM-GW or GM	A-1	10–20
Indianola: InC, InD, IoC, IoE	>60	>5	0–60	Loamy sand, sand, and loamy fine sand (sandy loam surface layer in places).	SM	A-2	0
Itswoot: ITD, ITF	>60	>5	0–60	Very cobbly silt loam and silty clay loam.	CL	A-2, A-4, or A-6	25–45
Kalaloch:							
KAB	>60	>5	0–25	Loam and fine sandy loam.	SM or ML	A-4	0
			25–60	Loamy fine sand or fine sand.	SM	A-1 or A-2	0
KCC	>60	>5	0–24	Gravelly loam and fine sandy loam.	SM	A-4 or A-2	0
			24–60	Very gravelly loamy fine sand and gravelly loamy fine sand.	GP-GM or SP-SM	A-1	0

significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity to—		Frost-action potential
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete	
				Inches per hour	*Inches per inch of soil*	*pH*				
100	85–100	70–85	35–50	2.0–6.0	0.13–0.15	4 5–5 5	Low	High	Moderate	None.
25–45	20–40	5 15	0 5	6.3–20.0	0.05–0.07	5 1–6 0	Low	Moderate	Moderate.	
0	90–100	80–95	60–80	0 6–2.0	0.19–0 21	4.5–5.5	Low	High	Moderate or high.	None.
25–45	20–40	5–15	0–5	2.0–6.3	0.04–0.06	5 1–6 0	Low	Moderate	Moderate.	
65–70	60–65	55–65	50–60	0.6–2.0	0.14–0 16	4.5–6 0	Low or moderate.	High	Moderate	Slight.
55–70	50–65	45–65	40–60	<0.06			Low	High	Moderate.	
65–80	60–70	55–65	50–60	0.6–2 0	0.14–0 16	4.5–5 0	Low or moderate.	High	High	Slight
65–80	60–70	55–65	50–60	<0 06			Low	High	High	Slight.
35–50	30–45	20–40	5–20	2 0–6 0	0.07–0 09	5 1–6 5	Low	Moderate	High	Slight.
30–45	25–40	20–30	10–20	<0 06			Low	Moderate	High	Slight.
25–55	20–50	15–30	5–15	6 3–20 0	0.04–0 06	5.1–7.0	Low	Moderate	Moderate	None.
90–100	80–90	50–75	15–30	6.0–20 0	0 09–0 12	5 6–6.0	Low	Moderate	Moderate	Slight.
30–40	25–35	15–30	5 15	6.0 20.0	0.03 0.05	5 6–6 0	Low	Low	Moderate	
85 95	75 90	50 70	15–30	6 0–20 0	0.06–0.08	5 6–6 5	Low	Low	Moderate	Slight.
30–65	25–60	20–55	20–50	0.2–0 6	0.08–0 10	5.1 6 0	Moderate	High	Moderate	None.
95–100	85 95	70 85	40–65	0 6–2 0	0 15–0.17	4 5–5.5	Low	High	High	None.
65–100	60–95	40–75	5–20	6 3–20 0	0 05–0 07	4 5–5 5	Low	Moderate	High.	
65 85	60–80	50–65	30–50	0 6–2.0	0.11–0 14	4 5–5 5	Low	High	High	None.
30–85	25–70	20–35	5–15	6 3 20 0	0 03–0 05	4 5–5 5	Low	Moderate	High.	

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface of typical profile [1]	USDA texture	Classification		Coarse fraction greater than 3 inches
	Bedrock [1]	Seasonal high water table [1]			Unified	AASHO	
	Inches	*Feet*	*Inches*				*Percent*
Kitsap:							
KsC, KsD	>60	[2] 2–3	0–30	Gravelly loam	ML	A-4	0–15
			30–60	Silty clay loam	CL	A-6	0
KtC, KtD, KtE	>60	[2] 1½–3	0–21	Silt loam	CL or ML	A-4	0
			21–32	Silty clay loam	CL	A-6	0
			32–60	Silt loam and silty clay loam	ML or CL	A-4 or A-6	0
*Klone: KGD, KGF, KLD, KLF, KND, KOC. For Hoko part of KND, see Hoko series, unit HKD. For Tealwhit part of KOC, see Tealwhit series, unit TEB.	>60	>5	0–36	Gravelly silt loam and cobbly loam.	ML or CL	A-4	0–30
			36–60	Very gravelly sandy loam and very gravelly loamy sand.	GP-SM	A-1	0–30
Lummi: Lu	>60	[3] 1–2	0–60	Silt loam	ML	A-4	100
Lystair: LyC	>60	>5	0–14	Fine sandy loam	SM	A-4	100
			14–60	Stratified loamy fine sand and fine sand.	SM	A-2	100
*McMurray: Mm. For Mukilteo part of Mm, see Mukilteo series.	>60	[5] 0–1	0–60	Mucky peat	Pt	A-8	----------
*Mukilteo:							
Mm. For McMurray part of Mm, see McMurray series.	>60	[5] 0–1	0–60	Peat and mucky peat	Pt	A-8	----------
Mu	>60	[5] 0–1	0–38	Fibrous peat	Pt	A-8	----------
			38–60	Loam and sandy loam	SM or ML	A-4	0
*Olete: OeD, OeE, OlD, OmD, OpD, OrF. For Alderwood part of OlD, see Alderwood series, unit AlC. For Clallam part of OmD, see Clallam series, unit CmC. For Hoodsport part of OpD, see Hoodsport series, unit HoC. Rock outcrop part of OrF too variable for valid estimates.	20–30	>5	0–24	Very gravelly silt loam	GM	A-2	10–20
			24	Basalt bedrock.			
Phelan: PHF	>60	[2] 1–1½	0–16	Gravelly and very gravelly silt loam.	GM	A-2	10–20
			16–20	Weakly cemented, very compact very gravelly silt loam glacial till.	GM	A-1 or A-2	0–25
Queets: QT	>60	[3] 3–5	0–39	Silt loam	ML or CL	A-4 or A-6	0
			39–60	Fine sandy loam	ML or SM	A-4	0
Quilcene: QuC, QuD, QuE	20–40	[2] 1½–3½	0–19	Silty clay loam and silt loam.	CL	A-6	0
			19–27	Gravelly clay	CH	A-7	0–5
			27–54	Weathered shale.			
Riverwash: Rh, RW Too variable for valid estimates.							

significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity to—		Frost-action potential
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete	
				Inches per hour	*Inches per inch of soil*	*pH*				
70–80	65–75	60–70	50–60	0 6–2 0	0.12 0 14	5.1–6 5	Low	Moderate	Moderate	Slight.
100	100	80–90	75–85	<0 06	0.04–0 06	6.6–7.0	Moderate	High	Low.	
100	95–100	90–100	80–90	0 6–2 0	0 19–0.21	5 6–6.5	Low or moderate	Moderate	Moderate	Slight
100	95–100	90–100	80–90	0 2–0 6	0 17–0 20	6 1–6.5	Moderate	High	Low.	
95–100	80 90	75–85	70–80	<0 06	0 04–0.06	6 1 6 5	Low or moderate.	High	Low	
60–70	50–65	45–60	35 55	0 6–2 0	0 14–0 16	4.5–6.0	Low or moderate.	High	High	None.
40–45	25–40	15–30	5–15	2.0–6 3	0 03–0 05	5 6–6 5	Low	Low	High.	
100	100	90–100	80–90	0.6–2 0	0.18–0.20	6.1–7.0	Low	High	Low	Slight.
95–100	90–100	70–80	35–45	2.0–6 0	0.13–0 15	5.6–7 0	Low	Moderate	Low	None.
95–100	85–95	60–75	20–35	6.3–20.0	0 08–0 11	6.0–7.0	Low	Low	Low	
				0 6–2 0	0 40–0 50	6.6–7.0	High shrink, low swell.	High	Low	Slight.
				0 6–2.0	0 3–0 4	5 1–6 5	High shrink, low swell.	High	Moderate	Slight.
				0 6–2 0	0 3–0 4	5 1–6.5	High shrink, low swell.	High	High	Slight.
100	100	70–80	40	0.6–2 0	0 11–0 18	5 1 6 5	Low	High	Moderate	
35–65	25–40	25–35	35	0.6–2 0	0 8–0 10	6.1–6 5	Low	Moderate	Low	None.
45–60	30–45	30–40	25–35	0.6–2 0	0.08–0.10	4.5 5.0	Low	High	High	Slight.
30–45	25–40	25–35	20–30	<0.06			Low	High	High	
100	100	95–100	80–90	0 6–2.0	0.18–0.20	5.1–5.5	Low or moderate.	High	Moderate	Slight.
100	95–100	80–85	40–55	2 0–6 3	0 13 0.15	5.6–6 0	Low	High	Moderate	
95–100	80–90	80–90	70–80	0.2–0 6	0 18–0.20	5.1–6 0	Moderate	High	Moderate	Slight
85–95	65–75	60–70	55–70	0 06 0 2	0.10–0.12	5 6–6.0	High	High	Moderate	

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface of typical profile [1]	USDA texture	Classification		Coarse fraction greater than 3 inches
	Bedrock [1]	Seasonal high water table [1]			Unified	AASHO	
	Inches	*Feet*	*Inches*				*Percent*
Rock land: Rk. Too variable for valid estimates							
Rough broken land: Ro, RY Too variable for valid estimates.							
San Juan: SaB	>60	>5	0–17	Gravelly sandy loam	SM	A-2	0–5
			17–60	Gravelly coarse sand	SW	A-1	0–10
Sekiu: SC	>60	½–1	60	Clay	CH	A-7	0
Semiahmoo.							
Se	>60	[5] 0–1	0–60	Muck and mucky peat	Pt	A-8	----------
Sh	>60	[5] 0–1	0–31	Muck and mucky peat	Pt	A-8	----------
			31–60	Sandy clay loam and clay with thin layers of sandy loam, loamy sand, and sandy clay loam	CL	A-6	0
Sm	>60	[5] 0–1	0–24	Muck	Pt	A-8	----------
			24–60	Sandy clay loam and clay with thin layers of loamy sand and sandy loam.	CL	A-6	0
Sinclair: SnC, SnD	>60	[2] 2–3	0–25	Gravelly sandy loam	SM	A-1 or A-2	0–10
			25–48	Weakly cemented, very compact gravelly loamy sand glacial till	GP-GM or SM	A-1	0–25
Snahopish: SPD	40–60	>5	0–30	Gravelly heavy silty clay loam	MH	A-7	0–5
			30–60	Very gravelly silty clay loam.	GC	A-2	10–25
Snohomish: So	>60	0 1	0–17	Silty clay	CH	A-7	0
			17–60	Peat	Pt	A-8	----------
*Solleks: SSE, SVE For Hoko part of SVE, see Hoko series, unit HKE.	30–48	>5	0–42	Very channery silty clay loam.	GC	A-2 or A-4	0–20
			42	Shale bedrock.			
*Swantown:							
StB	>60	½–1	0–22	Gravelly sandy loam	SM	A-1 or A-2	0–5
			22–32	Weakly cemented, very compact gravelly sandy loam glacial till	GM	A-1	0–25
SuB, SwC For Alderwood part of SwC, see Alderwood series, unit AmC.	>60	[2] ½–1	0–22	Gravelly loam	SM	A-2	0–10
			22–32	Weakly cemented, very compact gravelly loam glacial till	GM or SM	A-2 or A-1	0–25
Tealwhit: TEB	>60	0–½	0–42	Heavy silty clay loam and silty clay.	CH	A-7	0
			42–60	Very fine sandy loam	ML	A-4	0

significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity to—		Frost-action potential
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete	
				Inches per hour	*Inches per inch of soil*	*pH*				
80–90	65–75	40–55	20–30	6.3–20.0	0.07–0.09	5.6–6.0	Low	Low	Moderate	None.
75–95	40–55	15–25	0–5	6.3–20.0	0.04–0.06	6.1–7.0	Low	Low	Moderate	
100	100	100	95–100	<0.06	0.14–0.16	4.5–5.5	High	High	High	Slight.
				0.6–2.0	0.3–0.4	5.6–7.0	High shrink, low swell.	High	Moderate	Slight.
				0.6–2.0	0.3–0.4	5.6–7.0	High shrink, low swell	High	Moderate	Slight.
100	100	70–85	65–70	0.06–0.2	0.14–0.16	6.1–7.0	Moderate	High	Moderate	
				0.6–2.0	0.3–0.4	5.6–7.0	High shrink, low swell.	High	Moderate	Slight.
100	100	70–85	65–70	0.06–0.2	0.14–0.16	6.1–7.0	Moderate	High	Moderate.	
60–70	40–55	30–40	15–25	2.0–6.0	0.07–0.09	5.1–6.0	Low	Moderate	Moderate	Slight.
40–70	35–65	20–40	5–20	<0.06			Low	Moderate	Moderate.	
85–95	60–75	60–75	55–70	0.2–0.6	0.15–0.17	4.5–5.5	Moderate	Moderate or high.	High	None.
40–55	15–30	15–25	15–25	0.6–2.0	0.08–0.10	5.1–6.0	Low	Moderate or high	Moderate	
100	100	95–100	85–95	0.06–0.2	0.17–0.19	5.6–6.5	High	High	Moderate	Slight.
				0.6–2.0	0.2–0.3	5.6–6.0	High shrink, low swell	High	Moderate	
50–60	30–45	30–40	25–40	0.6–2.0	0.08–0.10	4.5–6.0	Moderate	Moderate or high.	Moderate	None.
65–75	40–55	25–35	10–20	2.0–6.0	0.07–0.09	5.1–6.0	Low	Moderate	Moderate	Slight.
30–45	25–40	20–30	10–20	<0.06			Low	Moderate	Moderate	
65–75	40–55	35–50	25–35	0.6–2.0	0.12–0.14	5.6–6.5	Low	Moderate	Moderate	Slight.
40–70	35–65	30–55	20–35	<0.06			Low	Moderate	Moderate	
100	100	90–100	85–95	0.06–0.2	0.18–0.20	4.5–6.0	High	High	Moderate	Slight.
100	100	85–95	50–65	0.6–2.0	0.15–0.17	5.6–6.0	Low	High	Moderate.	

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface of typical profile [1]	USDA texture	Classification		Coarse fraction greater than 3 inches
	Bedrock [1]	Seasonal high water table [1]			Unified	AASHO	
	Inches	*Feet*	*Inches*				*Percent*
Tidal marsh: Td. Too variable for valid estimates.							
Tisch: Th	>60	[5] ½–1½	0–14	Silt loam	ML	A-4 or A-5	0
			14–31	Silt (volcanic ash and diatomaceous earth)	MH	A-5	0
			31–60	Stratified loamy sand and silty clay loam.	SM or SC	A-4 or A-6	0
Townsend:							
TlC	>60	[2] 1½–2½	0–22	Fine sandy loam and gravelly sandy loam.	SM	A-2	0–5
			22–30	Weakly cemented, very compact gravelly sandy loam glacial till.	GM or SM	A-1 or A-2	0–25
TnC	>60	[2] 1½–2½	0–18	Gravelly loam	SM	A-2 or A-4	0–5
			18–36	Gravelly sandy loam	SM	A-2	0–10
			36–48	Weakly cemented, very compact gravelly sandy loam.	GM or SM	A-2 or A-1	0–25
Triton: TrD, TrF	[4] 12–20	[2] 1–1½	0–17	Very gravelly loam and very gravelly sandy loam	GM	A-2 or A-1	0–5
			17–38	Weakly cemented, very gravelly sandy loam.	GM	A-1	0 10
			38	Basalt bedrock			
Tukey: TuC, TuD	>60	[2] 1½–2½	0–15	Gravelly loam	SM or SC	A-4 or A-6	0–10
			15–36	Gravelly clay loam	SC	A-6	5–10
			36–56	Weakly cemented, very compact gravelly clay loam glacial till.	GM or SM	A-2 or A-1	0–25
Wapato: Wa	>60	½–1½	0–42	Silty clay loam	CL	A-7	0
			42–60	Loamy sand	SM	A-2	0
Whidbey: WhC, WhD	>60	>5	0–26	Gravelly sandy loam	SM	A-1 or A-2	0–5
			26–60	Weakly cemented, very compact gravelly sandy loam glacial till.	GM or SM	A-1 or A-2	0–25

[1] Soils were examined only to a depth of 5 feet.
[2] Perched water table.
[3] Subject to occasional flooding.
[4] Depth to cemented layer.
[5] Subject to ponding.

capacity and stability of the subgrade and the workability of the soil material. The AASHO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation.

Dwellings, as rated in table 9, are not more than three stories high and are supported by foundation footings placed in undisturbed soil. The features that affect the rating of a soil for dwellings are those that relate to capacity to support load and resist settlement under load and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material

significant in engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity to—		Frost-action potential
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)					Uncoated steel	Concrete	
				Inches per hour	*Inches per inch of soil*	*pH*				
100	100	95–100	80–95	0.6–2 0	0 19–0 21	6.1–6.5	Low	High	Low	Slight.
100	100	100	95–100	0 6–2 0	0.19–0 21	6.6–7.0	Low	High	Low.	
95–100	95–100	85–100	40–50	0 2–0 6	0.12–0.17	6 6–7 0	Low or moderate.	High	Low.	
85–100	45–55	30–40	15–25	0.6–2 0	0.13–0.15	6.1–6.5	Low	Moderate	Low	Slight.
40–70	35–65	20–45	10–30	<0.06			Low	Moderate	Low.	
80–95	45–55	40–50	30–40	0.6–2.0	0 12–0.14	6.1–6.5	Low	Moderate	Low	Slight.
70–85	40–50	25–35	10–20	2 0–6.0	0.07–0.09	6.1–6.5	Low	Low	Low.	
40–70	35–65	30–55	20–35	<0 06			Low	Low	Low.	
40–50	30–40	25–35	15–25	0.6–2 0	0.8–0 10	5 6–6.5	Low	Moderate	Moderate	Slight.
40–50	30–40	20–30	15–20	<0.06			Low	Moderate	Moderate	Slight.
65–80	50–60			0.6–2.0	0.12–0.14	5.1–6.0	Low	Moderate	Moderate	Slight.
70–85	40–50	35–45	35–45	0.2–0.6	0.14–0.16	5.6–6.0	Moderate	High	Moderate.	
40–70	35–65	30–55	20–35	<0 06			Low	High	Moderate.	
95–100	95–100	90–100	85–95	0.06–0.2	0 18–0.20	5.6–7.0	Moderate	High	Low	Slight.
95–100	95–100	50–75	15–30	6.0–20.0	0.06–0 08	6.1–6.5	Low	High	Moderate.	
60–80	40 55	25–35	15–25	2.0–6.0	0 07–0.09	5.1–6.5	Low	Moderate	Moderate	None.
40–70	35–65	20–45	10–30	<0.06			Low	Moderate	Moderate.	

resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are among factors that are unfavorable.

Formation and Classification of the Soils

In this section the factors of soil formation are explained, the soil series are classified in higher categories, and these categories are defined.

Factors of Soil Formation

Soil is a natural body of loose material on the earth's surface. It is formed by the forces of climate and living matter acting on parent material, as conditioned by relief, over a period of time. The properties of a soil are determined by five factors: (1) the physical and mineral composition of the parent material; (2) the climate under which the soil material has accumulated and has existed since accumulation; (3) the relief, or lay of the land; (4) living organisms; and

TABLE 9.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in that series is made up of two or more kinds of soil. The soils in such to other series that appear in

Soil series and map symbols	Suitability as source of—		
	Topsoil	Sand and gravel	Road fill
Agnew: AgB, AgE	Fair: silty clay loam below a depth of 9 inches.	Unsuitable: fine-grained.	Poor: low strength
*Ahl: AhF, AkF Rock outcrop part of AkF too variable for valid estimates.	Poor: very gravelly	Poor to unsuitable: excessive fines; limited quantity.	Poor: bedrock at a depth of 24 to 40 inches.
*Alderwood: AlC, AlD, AlE, AuC For Quilcene part of AuC, see Quilcene series.	Poor: gravelly	Poor to unsuitable: excessive fines; cemented below a depth of 20 to 40 inches.	Good
AmC, AmD	Poor: gravelly	Poor to unsuitable: excessive fines; cemented below a depth of 20 to 40 inches.	Good
*Beausite: BaD, BaE, BdD, BdE, BeE For Alderwood part of BdD, see Alderwood series, unit AlC. For Alderwood part of BdE, see Alderwood series, unit AlE. Rock outcrop part of BeE too variable for valid estimates.	Poor: gravelly	Unsuitable for gravel; poor to unsuitable for sand; excessive fines; limited quantity.	Poor: bedrock at a depth of 20 to 36 inches.
Belfast: Bf	Good	Unsuitable for gravel; poor to unsuitable for sand: excessive fines.	Fair: low strength
Bg	Good	Unsuitable: fine grained.	Fair: low strength
Bh	Good	Unsuitable: fine grained.	Fair: low strength
Bk	Poor: poorly drained	Unsuitable: fine grained.	Poor: poorly drained
Bm	Poor: poorly drained	Unsuitable: fine grained.	Poor: poorly drained

interpretations of the soils

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring the first column of this table]

Soil limitations for—				Soil features affecting—	
Septic-tank filter fields	Sewage lagoons	Local roads and streets	Dwellings without basements	Reservoir areas	Embankments, dikes, and levees
Severe moderately slow permeability, seasonal water table at a depth of 12 to 24 inches.	Severe: seasonal water table at a depth of 12 to 24 inches.	Severe· low strength.	Severe. seasonal water table at a depth of 12 to 24 inches; excessive slope in places.[1]	Moderately slow permeability; 0 to 50 percent slopes; seasonal water table at a depth of 12 to 24 inches.	Medium compressibility, seasonal water table at a depth of 12 to 24 inches.
Severe. bedrock at a depth of 24 to 40 inches; slope.	Severe: bedrock at a depth of 24 to 40 inches; slope.	Severe slope------	Severe· slope------	Moderate permeability, 50 to 70 percent slopes; bedrock at a depth of 24 to 40 inches.	Medium compressibility, semipervious when compacted, bedrock at a depth of 24 to 40 inches.
Severe very slow permeability; seasonal perched water table at a depth of 24 to 36 inches.	Moderate. 0 to 7 percent slopes; coarse fragments, perched water table. Severe: slopes greater than 7 percent.	Slight. 0 to 8 percent slopes Moderate. 8 to 15 percent slopes. Severe: slopes greater than 15 percent.[1]	Moderate· perched water table at a depth of 24 to 36 inches, 0 to 15 percent slopes. Severe. slopes greater than 15 percent.[1]	Very slow permeability, 0 to 50 percent slopes, perched water table.	Low compressibility; pervious when compacted; perched water table at a depth of 24 to 36 inches.
Severe. very slow permeability; seasonal perched water table at a depth of 24 to 36 inches.	Moderate: 0 to 7 percent slopes; coarse fragments, perched water table. Severe: slopes greater than 7 percent.	Slight. 0 to 8 percent slopes. Moderate 8 to 15 percent slopes. Severe. slopes greater than 15 percent.[1]	Moderate: perched water table at a depth of 24 to 36 inches; 0 to 15 percent slopes. Severe: slopes greater than 15 percent.[1]	Very slow permeability, 0 to 30 percent slopes; perched water table.	Medium compressibility; semipervious when compacted; perched water table at a depth of 24 to 36 inches.
Severe. bedrock at a depth of 20 to 36 inches, slope.	Severe bedrock at a depth of 20 to 36 inches; slope.	Moderate· bedrock at a depth of 20 to 36 inches; 0 to 15 percent slopes. Severe· slopes greater than 15 percent.	Moderate: bedrock at a depth of 20 to 36 inches, 0 to 15 percent slopes. Severe: slopes greater than 15 percent.	Moderately rapid permeability above bedrock; bedrock at a depth of 20 to 36 inches; 15 to 50 percent slopes.	Low compressibility; pervious when compacted, bedrock at a depth of 20 to 36 inches.
Severe: possible hazard of contaminating nearby water supplies; subject to flooding.	Severe. moderate permeability, subject to flooding.	Moderate· subject to flooding	Severe· subject to flooding.	Moderate permeability, 1 to 2 percent slopes.	Medium compressibility, semipervious when compacted.
Severe. subject to flooding.	Severe moderate permeability; subject to flooding.	Severe: high potential frost action; subject to flooding	Severe subject to flooding.	Moderate permeability, 1 to 2 percent slopes.	Medium compressibility; semipervious when compacted.
Severe. moderately slow permeability; subject to flooding.	Severe· subject to flooding, seasonal water table at a depth of 24 to 48 inches.	Severe subject to flooding [1]	Severe: subject to flooding.[1]	Moderately slow permeability, 1 to 2 percent slopes, seasonal water table at a depth of 24 to 48 inches	Medium compressibility; semipervious when compacted; seasonal water table at a depth of 24 to 48 inches.
Severe· moderately slow permeability; seasonal water table at a depth of 6 to 12 inches; subject to flooding.	Severe· subject to flooding, seasonal water table at a depth of 6 to 12 inches.	Severe: poorly drained; subject to flooding.[1]	Severe: subject to flooding; seasonal water table at a depth of 6 to 12 inches.[1]	Moderately slow permeability; 1 to 2 percent slopes, seasonal water table at a depth of 6 to 12 inches	Medium compressibility, semipervious when compacted, seasonal water table at a depth of 6 to 12 inches.
Severe· moderately slow permeability; subject to flooding; seasonal water table at a depth of 6 to 12 inches.	Severe: subject to flooding, seasonal water table at a depth of 6 to 12 inches.	Severe· poorly drained; subject to flooding [1]	Severe. subject to flooding, seasonal water table at a depth of 6 to 12 inches.	Moderately slow permeability, 1 to 2 percent slopes, seasonal water table at a depth of 6 to 12 inches.	Medium compressibility, semipervious when compacted; seasonal water table at a depth of 6 to 12 inches.

TABLE 9.—*Engineering*

Soil series and map symbols	Suitability as source of—		
	Topsoil	Sand and gravel	Road fill
*Calawah: CGB, CND, CVB. For Snahopish part of CND, see Snahopish series, unit SPD. For Tealwhit part of CVB, see Tealwhit series, unit TEB.	Good	Unsuitable. fine grained.	Poor: low strength
Carlsborg: CaC, CaD	Poor: gravelly	Poor to unsuitable: fine grained.	Good
Casey: CdB	Good in upper 17 inches; poor below.	Unsuitable fine grained.	Poor: high shrink-swell potential, low strength; seasonal water table at a depth of 12 to 24 inches.
CeB	Good in upper 17 inches; poor below.	Unsuitable· fine grained.	Poor· high shrink-swell potential.
* Cassolary: CfC, CfD, CfE, ChC, ChD, CkC, CkD, CkE. For Everett parts of ChC and ChD, see Everett series, units EvC and EvD. For Kitsap parts of CkC, CkD, and CkE, see Kitsap series, units KtC, KtD, and KtE.	Good	Unsuitable for gravel; poor to unsuitable for sand, excessive fines; limited quantity.	Fair: medium strength.
Cathcart: ClC, ClD, ClE	Poor: gravelly	Poor to unsuitable: excessive fines; limited quantity.	Poor: bedrock at a depth of 24 to 40 inches.
Clallam: CmC, CmD	Poor: gravelly	Poor to unsuitable: excessive fines; cemented below a depth of 20 to 40 inches.	Good
Coastal beaches: Co, CW. Too variable for valid estimates.			
Cut and fill land: Cu. Too variable for valid estimates.			
Dabob: DaC, DaD	Poor: very gravelly	Poor to unsuitable: excessive fines; cemented below a depth of 20 to 36 inches.	Good

interpretations of the soils—Continued

Soil limitations for—				Soil features affecting—	
Septic-tank filter fields	Sewage lagoons	Local roads and streets	Dwellings without basements	Reservoir areas	Embankments, dikes, and levees
Severe. moderately slow permeability, seasonal water table at a depth of 24 to 36 inches.	Severe: seasonal water table at a depth of 24 to 36 inches.	Severe: low strength.[1]	Severe: seasonal water table at a depth of 24 to 36 inches.	Moderately slow permeability, 0 to 8 percent slopes; seasonal water table at a depth of 24 to 36 inches.	Medium compressibility; semipervious when compacted; seasonal water table at a depth of 24 to 36 inches.
Slight· 0 to 8 percent slopes. Moderate: 8 go 15 percent slopes. Severe. slopes greater than 15 percent; possible hazard of contaminating nearby water supply.	Severe. rapid permeability, slopes greater than 7 percent in places.	Slight 0 to 8 percent slopes Moderate. 8 to 15 percent slopes. Severe: slopes greater than 15 percent.	Slight: 0 to 8 percent slopes. Moderate: 8 to 15 percent slopes. Severe: slopes greater than 15 percent.	Rapid permeability; 0 to 30 percent slopes.	Low compressibility; pervious when compacted.
Severe: slow permeability, seasonal water table at a depth of 12 to 24 inches.	Severe. seasonal water table at a depth of 12 to 24 inches.	Severe: high shrink-swell potential, seasonal water table at a depth of 12 to 24 inches.[1]	Severe: high shrink-swell potential, seasonal water table at a depth of 12 to 24 inches.[1]	Slow permeability; 0 to 8 percent slopes, seasonal water table at a depth of 12 to 24 inches.	High compressibility; seasonal water table at a depth of 12 to 24 inches.
Severe slow permeability, seasonal water table at a depth of 12 to 24 inches.	Severe. seasonal water table at a depth of 12 to 24 inches	Severe· high shrink-swell potential; seasonal water table at a depth of 12 to 24 inches.[1]	Severe· high shrink-swell potential; seasonal water table at a depth of 12 to 24 inches.[1]	Slow permeability; 0 to 8 percent slopes; seasonal water table at a depth of 12 to 24 inches.	High compressibility; seasonal water table at a depth of 12 to 24 inches.
Severe· moderately slow permeability, slope excessive in places.	Severe. moderately rapid to rapid permeability below a depth of 38 inches.	Moderate 0 to 15 percent slopes. Severe: slopes greater than 15 percent.	Moderate· 0 to 15 percent slopes; moderate shrink-swell potential. Severe: slopes greater than 15 percent.	Moderately rapid to rapid permeability below a depth of 38 inches; 0 to 50 percent slopes.	Medium compressibility; semipervious when compacted.
Severe· bedrock at a depth of 24 to 40 inches, slope excessive in places.	Severe bedrock at a depth of 24 to 40 inches, slope excessive in places.	Moderate: 0 to 15 percent slopes; bedrock at a depth of 24 to 40 inches. Severe: slopes greater than 15 percent.	Moderate. 0 to 15 percent slopes; bedrock at a depth of 24 to 40 inches. Severe. slopes greater than 15 percent.	Moderate permeability; 0 to 50 percent slopes, bedrock at a depth of 24 to 40 inches.	Medium compressibility; semipervious when compacted; bedrock at a depth of 24 to 40 inches.
Severe· very slow permeability, slope excessive in places.	Moderate 0 to 7 percent slopes, coarse fragments. Severe slopes greater than 7 percent.	Slight· 0 to 8 percent slopes. Moderate: 8 to 15 percent slopes. Severe: slopes greater than 15 percent.	Slight· 0 to 8 percent slopes. Moderate: 8 to 15 percent slopes. Severe: slopes greater than 15 percent.	Very slow permeability, 0 to 30 percent slopes	Low compressibility; semipervious when compacted.
Severe. very slow permeability, seasonal perched water table at a depth of 18 to 36 inches; slope excessive in places.	Moderate 0 to 7 percent slopes; coarse fragments; perched water table. Severe· slopes greater than 7 percent.	Slight: 0 to 8 percent slopes Moderate 8 to 15 percent slopes. Severe slopes greater than 15 percent.[1]	Moderate· 0 to 15 percent slopes; perched water table at a depth of 18 to 36 inches Severe· slopes greater than 15 percent.[1]	Very slow permeability; 0 to 30 percent slopes, perched water table at a depth of 18 to 36 inches.	Low compressibility; semipervious when compacted; perched water table at a depth of 18 to 36 inches.

TABLE 9.—*Engineering*

Soil series and map symbols	Suitability as source of		
	Topsoil	Sand and gravel	Road fill
Dick: DcC	Poor: loamy sand	Unsuitable for gravel; poor for sand; excessive fines.	Good
Dimal: DMF	Poor: very flaggy	Unsuitable: excessive fines, limited quantity.	Poor, bedrock at a depth of 10 to 20 inches.
Everett: EvC, EvD, EvE	Poor: gravelly	Good for gravel; good for sand if sieved	Good
Grove:			
GoC, GoD, GoE	Poor: very gravelly	Good to fair for gravel; good to fair for sand if sieved.	Good
GrC, GrD	Poor: very gravelly	Good for gravel, good to fair for sand if sieved	Good
Hoh:			
HF	Good	Good for gravel, good for sand if sieved.	Fair: medium strength
HH	Good	Good for gravel, good for sand if sieved.	Fair: medium strength
* Hoko:			
HKC, HKD, HKE, HLE, HMC. For Snahopish part of HLE, see Snahopish series, unit SPD. For Tealwhit part of HMC, see Tealwhit series, unit TEB.	Poor: gravelly	Unsuitable: fine grained	Fair: low strength
HNB	Poor: gravelly	Unsuitable: fine grained.	Poor: poorly drained

interpretations of the soils—Continued

Soil limitations for—				Soil features affecting—	
Septic-tank filter fields	Sewage lagoons	Local roads and streets	Dwellings without basements	Reservoir areas	Embankments, dikes, and levees
Slight: 0 to 8 percent slopes. Moderate 8 to 15 percent slopes; possible contamination of ground water.	Severe: rapid permeability; slopes greater than 7 percent in places.	Slight: 0 to 8 percent slopes. Moderate. 8 to 15 percent slopes.	Slight: 0 to 8 percent slopes. Moderate. 8 to 15 percent slopes.	Rapid permeability, 0 to 15 percent slopes.	Low compressibility, pervious when compacted.
Severe: bedrock at a depth of 10 to 20 inches; slope	Severe bedrock at a depth of 10 to 20 inches; slope, very flaggy.	Severe: bedrock at a depth of 10 to 20 inches, slope.	Severe. bedrock at a depth of 10 to 20 inches; slope.	Bedrock at a depth of 10 to 20 inches; 50 to 90 percent slopes.	Medium compressibility; semipervious when compacted; bedrock at a depth of 10 to 20 inches.
Slight 0 to 8 percent slopes. Moderate: 8 to 15 percent slopes. Severe: slopes greater than 15 percent, possible hazard of contaminating nearby water supplies.	Severe: rapid permeability; slopes greater than 7 percent in places.	Slight. 0 to 8 percent slopes. Moderate: 8 to 15 percent slopes. Severe: slopes greater than 15 percent.	Slight 0 to 8 percent slopes. Moderate: 8 to 15 percent slopes. Severe: slopes greater than 15 percent.	Rapid permeability; 0 to 50 percent slopes.	Low compressibility; pervious when compacted.
Slight: 0 to 8 percent slopes Moderate. 8 to 15 percent slopes. Severe. slopes greater than 15 percent, possible hazard of contaminating nearby water supplies.	Severe: very rapid permeability, slopes greater than 7 percent in places.	Slight: 0 to 8 percent slopes. Moderate. 8 to 15 percent slopes Severe: slopes greater than 15 percent.	Slight 0 to 8 percent slopes. Moderate: 8 to 15 percent slopes. Severe: slopes greater than 15 percent.	Very rapid permeability; 0 to 50 percent slopes.	Low compressibility; pervious when compacted
Severe: slow or very slow permeability, slopes greater than 15 percent in places, possible hazard of contaminating nearby water supplies.	Severe very rapid permeability below a depth of 40 inches; slopes greater than 7 percent in places.	Slight 0 to 8 percent slopes. Moderate: 8 to 15 percent slopes Severe. slopes greater than 15 percent.	Slight: 0 to 8 percent slopes. Moderate. 8 to 15 percent slopes. Severe. slopes greater than 15 percent.	Very rapid permeability below a depth of 40 inches, 0 to 30 percent slopes.	Low compressibility; pervious when compacted.
Severe: subject to flooding, possible hazard of contaminating nearby ground water.	Severe: rapid permeability, subject to flooding.	Moderate subject to flooding.	Severe: subject to flooding.	Rapid permeability; 0 to 2 percent slopes.	Low compressibility, pervious when compacted.
Severe subject to flooding; possible hazard of contaminating nearby ground water.	Severe moderately rapid to rapid permeability; subject to flooding.	Moderate: subject to flooding	Severe: subject to flooding	Moderately rapid to rapid permeability; 0 to 2 percent slopes.	Low to medium compressibility; semipervious to pervious when compacted.
Severe: very slow permeability, seasonal perched water table at a depth of 18 to 36 inches.	Moderate 0 to 7 percent slopes, coarse fragments, perched water table. Severe: slopes greater than 7 percent.	Moderate: 0 to 15 percent slopes, moderate shrink-swell potential Severe slopes greater than 15 percent.[1]	Moderate 0 to 15 percent slopes; perched water table at a depth of 18 to 36 inches.[1]	Very slow permeability, 0 to 50 percent slopes, perched water table at a depth of 18 to 36 inches.	Medium compressibility, semipervious when compacted, perched water table at a depth of 18 to 36 inches.
Severe. very slow permeability, seasonal perched water table at a depth of 6 to 12 inches.	Moderate coarse fragments, perched water table.	Severe: poorly drained.[1]	Severe perched water table at a depth of 6 to 12 inches.[1]	Very slow permeability, 0 to 8 percent slopes, perched water table at a depth of 6 to 12 inches.	Medium to low compressibility; perched water table at a depth 6 to 12 inches.

TABLE 9.—*Engineering*

Soil series and map symbols	Suitability as source of—		
	Topsoil	Sand and gravel	Road fill
* Hoodsport: HoC, HoD, HrD For Grove part of HrD, see Grove series, unit GoD.	Poor: gravelly	Poor to unsuitable: excessive fines; cemented below a depth of 20 to 36 inches.	Good
HpC	Poor: gravelly	Poor to unsuitable: excessive fines, cemented below a depth of 20 to 36 inches.	Fair: moderate potential frost action.
Hoypus: HuC, HuD, HuE, HvC	Poor: gravelly	Fair to poor for gravel, fair to poor for sand if sieved; excessive fines.	Good
Huel: HW	Poor: loamy fine sand	Fair to poor for gravel; excessive fines; unsuitable for sand; limited quantity.	Good
Indianola: InC, InD, IoC, IoE	Poor: loamy sand and sand.	Unsuitable for gravel, poor for sand; excessive fines.	Good
Itswoot: ITD, ITF	Poor: very cobbly	Unsuitable: fine grained.	Fair: moderate shrink-swell potential.
Kalaloch: KAB	Good	Unsuitable for gravel; fair to poor for sand; excessive fines	Good
KCC	Poor: gravelly	Fair: excessive fines	Good

interpretations of the soils—Continued

Soil limitations for—				Soil features affecting—	
Septic-tank filter fields	Sewage lagoons	Local roads and streets	Dwellings without basements	Reservoir areas	Embankments, dikes, and levees
Severe very slow permeability, slopes greater than 15 percent in places, seasonal perched water table at a depth of 24 to 36 inches.	Moderate: 0 to 7 percent slopes; coarse fragments, perched water table at a depth of 24 to 36 inches. Severe: slopes greater than 7 percent.	Slight· 0 to 8 percent slopes. Moderate 8 to 15 percent slopes. Severe slopes greater than 15 percent.[1]	Moderate: 0 to 15 percent slopes; perched water table at a depth of 24 to 36 inches Severe: slopes greater than 15 percent.[1]	Very slow permeability, 0 to 30 percent slopes, perched water table at a depth of 24 to 36 inches.	Low compressibility; perched water table at a depth of 24 to 36 inches.
Severe: very slow permeability; seasonal perched water table at a depth of 24 to 36 inches.	Moderate 0 to 7 percent slopes; coarse fragments; perched water table Severe: slopes greater than 7 percent.	Moderate: 0 to 15 percent slopes; moderate potential frost action Severe. slopes greater than 15 percent.[1]	Moderate· 0 to 15 percent slopes, perched water table at a depth of 24 to 36 inches, moderate potential frost action. Severe· slopes greater than 15 percent [1]	Very slow permeability; 0 to 15 percent slopes, perched water table at a depth of 24 to 36 inches.	Medium compressibility, semipervious when compacted, perched water table at a depth of 24 to 63 inches.
Slight 0 to 8 percent slopes Moderate 8 to 15 percent slopes Severe slopes greater than 15 percent, possible hazard of contaminating nearby ground water.	Severe rapid permeability, slopes greater than 7 percent in places	Slight· 0 to 8 percent slopes Moderate 8 to 15 percent slopes. Severe: slopes greater than 15 percent.	Slight: 0 to 8 percent slopes. Moderate 8 to 15 percent slopes. Severe: slopes greater than 15 percent.	Rapid permeability, 0 to 50 percent slopes.	Low compressibility; pervious when compacted.
Severe seasonal water table at a depth of 36 to 60 inches, subject to flooding, possible hazard of contaminating nearby ground water.	Severe· rapid permeability, subject to flooding.	Moderate subject to flooding [1]	Severe subject to flooding.[1]	Rapid permeability, 0 to 3 percent slopes, seasonal water table at a depth of 36 to 60 inches.	Low compressibility; pervious when compacted, seasonal water table at a depth of 36 to 60 inches.
Slight 0 to 8 percent slopes. Moderate 8 to 15 percent slopes. Severe· slopes greater than 15 percent, possible hazard of contaminating nearby ground water.	Severe· rapid permeability, slopes greater than 7 percent in places.	Slight: 0 to 8 percent slopes Moderate 8 to 15 percent slopes. Severe slopes greater than 15 percent.	Slight: 0 to 8 percent slopes Moderate: 8 to 15 percent slopes. Severe. slopes greater than 15 percent.[1]	Rapid permeability, 0 to 50 percent slopes.	Low compressibility; pervious when compacted.
Severe moderately slow permeability.	Severe· slopes greater than 7 percent in places, very cobbly.	Moderate· 0 to 15 percent slopes, moderate shrink-swell potential, very cobbly. Severe: slopes greater than 15 percent.	Moderate· 0 to 15 percent slopes, moderate shrink-swell potential. Severe. slopes greater than 15 percent.	Moderately slow permeability, 0 to 60 percent slopes.	Medium compressibility, semipervious when compacted.
Slight: possible hazard of contaminating nearby ground water.	Severe· rapid permeability.	Slight----------	Slight----------	Rapid permeability, 0 to 8 percent slopes.	Low compressibility; pervious when compacted
Slight: 0 to 8 percent slopes. Moderate· 8 to 15 percent slopes; possible hazard of contaminating nearby ground water.	Severe· rapid permeability, slopes greater than 7 percent in places.	Slight. 0 to 8 percent slopes. Moderate 8 to 15 percent slopes.	Slight. 0 to 8 percent slopes Moderate: 8 to 15 percent slopes.	Rapid permeability, 0 to 15 percent slopes.	Low compressibility; pervious when compacted.

TABLE 9.—*Engineering*

Soil series and map symbols	Suitability as source of—		
	Topsoil	Sand and gravel	Road fill
Kitsap: KsC, KsD	Poor: gravelly	Unsuitable: fine grained.	Poor: low strength
KtC, KtD, KtE	Good	Unsuitable: fine grained.	Poor: low strength
* Klone: KGD, KGF, KLD, KLF, KND, KOC For Hoko part of KND, see Hoko series, units HKC, HKD, and HKE For Tealwhit part of KOC, see Tealwhit series, unit TEB.	Poor: gravelly	Fair for gravel, fair for sand if sieved, excessive fines	Good below a depth of about 36 inches
Lummi: Lu	Poor: poorly drained	Unsuitable: fine grained.	Poor: poorly drained
Lystair: Lyc	Fair: 14 inches of fine sandy loam.	Unsuitable for gravel; poor for sand, excessive fines.	Good
* McMurray: Mm For Mukilteo part of Mm, see Mukilteo series.	Poor: very poorly drained.	Unsuitable: no sand or gravel	Poor: very poorly drained, organic material
* Mukilteo: Mm For McMurray part of Mm, see McMurray series.	Poor: very poorly drained	Unsuitable. no sand or gravel	Poor: very poorly drained, organic material
Mu	Poor very poorly drained.	Unsuitable: no sand or gravel.	Poor: very poorly drained.

interpretations of the soils—Continued

Soil limitations for—				Soil features affecting—	
Septic-tank filter fields	Sewage lagoons	Local roads and streets	Dwellings without basements	Reservoir areas	Embankments, dikes, and levees
Severe· very slow permeability, slopes greater than 15 percent in places, seasonal perched water table at a depth of 24 to 36 inches.	Moderate: 0 to 7 percent slopes; coarse fragments; perched water table at a depth of 24 to 36 inches. Severe: slopes greater than 7 percent.	Severe: low strength [1]	Severe slippage hazard on slopes; low strength.[1]	Very slow permeability; 0 to 30 percent slopes, perched water table at a depth of 24 to 36 inches.	Medium to high compressibility; semipervious when compacted, perched water table at a depth of 24 to 36 inches.
Severe· very slow permeability; slopes greater than 15 percent in places, seasonal perched water table at a depth of 18 to 36 inches.	Slight: 0 to 2 percent slopes. Moderate. 2 to 7 percent slopes, perched water table. Severe: slopes greater than 7 percent.	Severe: low strength, seasonal water table at a depth of 18 to 36 inches.[1]	Severe· slippage hazard, seasonal water table at a depth of 18 to 36 inches.[1]	Very slow permeability, 0 to 50 percent slopes, perched water table at a depth of 18 to 36 inches.	Medium to high compressibility; semipervious when compacted, perched water table at a depth of 18 to 36 inches.
Slight: 0 to 8 percent slopes. Moderate: 8 to 15 percent slopes. Severe: slopes greater than 15 percent.	Severe. moderately rapid permeability below a depth of 36 inches; slopes greater than 7 percent in places.	Moderate: 0 to 15 percent slopes. Severe· slopes greater than 15 percent.	Slight: 0 to 8 percent slopes. Moderate· 8 to 15 percent slopes. Severe. slopes greater than 15 percent	Moderately rapid permeability, 0 to 60 percent slopes.	Medium to low compressibility; semipervious to pervious when compacted
Severe· seasonal water table at a depth of 12 to 24 inches.	Severe· subject to flooding, seasonal water table at a depth of 12 to 24 inches.	Severe: poorly drained, low strength.[1]	Severe. occasional flooding; seasonal water table at a depth of 12 to 24 inches.[1]	Moderate permeability, 0 to 2 percent slopes, seasonal water table at a depth of 12 to 24 inches.	Medium compressibility; semipervious when compacted, seasonal water table at a depth of 12 to 24 inches.
Slight: 0 to 8 percent slopes. Moderate: 8 to 15 percent slopes; possible hazard of contaminating nearby ground water.	Severe: rapid permeability, slopes greater than 7 percent in places.	Slight: 0 to 8 percent slopes Moderate: 8 to 15 percent slopes.	Slight: 0 to 8 percent slopes. Moderate 8 to 15 percent slopes.	Rapid permeability; 0 to 15 percent slopes.	Low compressibility; pervious when compacted.
Severe: seasonal water table at a depth of 0 to 12 inches.	Severe: high organic-matter content, seasonal water table at a depth of 0 to 12 inches.	Severe· very poorly drained, organic material.[1]	Severe· organic material; seasonal water table at a depth of 0 to 12 inches.[1]	Moderate permeability, 0 to 2 percent slopes, seasonal water table at a depth of 0 to 12 inches.	High compressibility, pervious when compacted; organic material; seasonal water table at a depth of 0 to 12 inches.
Severe seasonal water table at a depth of 0 to 12 inches.	Severe. high organic-matter content; seasonal water table at a depth of 0 to 12 inches.	Severe very poorly drained, organic material.[1]	Severe· organic material, seasonal water table at a depth of 0 to 12 inches.[1]	Moderate permeability; 0 to 2 percent slopes; seasonal water table at a depth of 0 to 12 inches.	High compressibility; pervious when compacted; organic material, seasonal water table at a depth of 0 to 12 inches.
Severe: seasonal water table at a depth of 0 to 12 inches.	Severe: high organic-matter content; seasonal water table at a depth of 0 to 12 inches.	Severe· very poorly drained; organic material.[1]	Severe: organic material, seasonal water table at a depth of 0 to 12 inches.[1]	Moderate permeability; 0 to 2 percent slopes, seasonal water table at a depth of 0 to 12 inches.	High compressibility; pervious when compacted; organic material, seasonal water table at a depth of 0 to 12 inches.

TABLE 9.—*Engineering*

Soil series and map symbols	Suitability as source of—		
	Topsoil	Sand and gravel	Road fill
* Olete: OeD, OeE, OlD, OmD, OpD, OrF. For Alderwood part of OlD, see Alderwood series, unit AlC. For Clallam part of OmD, see Clallam series, unit CmC. For Hoodsport part of OpD, see Hoodsport series, unit HoC. Rock outcrop part of OrF too variable for valid estimates.	Poor: very gravelly	Unsuitable: excessive fines, limited quantity.	Poor: bedrock at a depth of 20 to 30 inches.
Phelan: PHF	Poor: gravelly	Poor to unsuitable: excessive fines; cemented below a depth of 10 to 20 inches.	Good
Queets: QT	Good	Unsuitable: fine grained.	Fair: medium strength
* Quilcene: QuC, QuD, QuE	Fair: silty clay loam	Unsuitable: fine grained.	Poor: high shrink-swell potential.
Riverwash: Rh, RW. Too variable for valid estimates.			
Rock land: Rk. Too variable for valid estimates.			
Rough broken land: Ro, RY. Too variable for valid estimates.			
San Juan: SaB	Poor: gravelly	Good for sand, unsuitable for gravel; small amount of gravel in places.	Good
Sekiu: SC	Poor: clay; poorly drained.	Unsuitable: fine grained.	Poor: poorly drained
Semiahmoo: Se	Poor: very poorly drained.	Unsuitable: no sand or gravel.	Poor: very poorly drained, organic material.
Sh	Poor: very poorly drained.	Unsuitable: no sand or gravel.	Poor: very poorly drained.

interpretations of the soils—Continued

Soil limitations for—				Soil features affecting—	
Septic-tank filter fields	Sewage lagoons	Local roads and streets	Dwellings without basements	Reservoir areas	Embankments, dikes, and levees
Severe. bedrock at a depth of 20 to 30 inches; slopes greater than 15 percent in places.	Severe: bedrock at a depth of 20 to 30 inches, slopes greater than 7 percent in places.	Moderate: 0 to 15 percent slopes; bedrock at a depth of 20 to 30 inches. Severe: slopes greater than 15 percent.	Moderate: 0 to 15 percent slopes, bedrock at a depth of 20 to 30 inches. Severe: slopes greater than 15 percent.	Moderate permeability, 0 to 50 percent slopes; bedrock at a depth of 20 to 30 inches.	Low compressibility; semipervious when compacted, bedrock at a depth of 20 to 30 inches.
Severe· very slow permeability; slope.	Severe. slope	Severe: slope[1]	Severe. slope[1]	Very slow permeability; 30 to 80 percent slopes.	Low compressibility, semipervious when compacted.
Severe· subject to flooding; seasonal water table at a depth of 36 to 60 inches.	Severe subject to flooding, seasonal water table at a depth of 36 to 60 inches.	Severe: subject to flooding.[1]	Severe· subject to flooding.[1]	Moderately rapid permeability, 0 to 3 percent slopes, seasonal water table at a depth of 36 to 60 inches.	Medium compressibility; semipervious when compacted; seasonal water table at a depth of 36 to 60 inches.
Severe· slow permeability; bedrock at a depth of 20 to 40 inches; slopes greater than 15 percent in places; seasonal perched water table at a depth of 18 to 42 inches	Severe bedrock at a depth of 20 to 40 inches, slopes greater than 15 percent in places.	Severe. high shrink-swell potential, slope in places.[1]	Severe: high shrink-swell potential.[1]	Slow permeability; 0 to 50 percent slopes; bedrock at a depth of 20 to 40 inches, perched water table.	High compressibility; bedrock at a depth of 20 to 40 inches; perched water table at a depth of 18 to 42 inches.
Slight: possible hazard of contaminating nearby ground water.	Severe: rapid permeability	Slight	Slight	Rapid permeability; 0 to 8 percent slopes.	Low compressibility; pervious when compacted.
Severe: very slow permeability, seasonal water table at a depth of 6 to 12 inches.	Severe: seasonal water table at a depth of 6 to 12 inches.	Severe. poorly drained.[1]	Severe seasonal water table at a depth of 6 to 12 inches.[1]	Very slow permeability; 0 to 8 percent slopes; seasonal water table at a depth of 6 to 12 inches.	High compressibility; impervious when compacted; seasonal water table at a depth of 6 to 12 inches.
Severe. seasonal water table at a depth of 0 to 12 inches.	Severe: organic material, seasonal water table at a depth of 0 to 12 inches.	Severe· very poorly drained; organic material.[1]	Severe· organic material; seasonal water table at a depth of 0 to 12 inches.[1]	Moderate permeability, 0 to 2 percent slopes; seasonal water table at a depth of 0 to 12 inches.	High compressibility; pervious when compacted, organic material; seasonal water table at a depth of 0 to 12 inches.
Severe: seasonal water table at a depth of 0 to 12 inches.	Severe: organic material; seasonal water table at a depth of 0 to 12 inches.	Severe: very poorly drained; organic material.[1]	Severe: organic material; seasonal water table at a depth of 0 to 12 inches.[1]	Slow permeability; 0 to 2 percent slopes; seasonal water table at a depth of 0 to 12 inches.	High compressibility, pervious when compacted; organic material; seasonal water table at a depth of 0 to 12 inches.

TABLE 9.—*Engineering*

Soil series and map symbols	Suitability as source of—		
	Topsoil	Sand and gravel	Road fill
Sm	Poor: very poorly drained.	Unsuitable: no sand or gravel.	Poor: very poorly drained.
Sinclair: SnC, SnD	Poor: gravelly	Poor to unsuitable: excessive fines; cemented below a depth of 20 to 40 inches.	Good
Snahopish: SPD	Fair: silty clay loam to a depth of 10 inches.	Unsuitable: excessive fines.	Fair: moderate potential frost action; moderate shrink-swell potential.
Snohomish: So	Poor: poorly drained	Unsuitable: organic material below a depth of 17 inches.	Poor: poorly drained
* Solleks: SSE, SVE For Hoko part of SVE, see Hoko series, unit HKE.	Poor: channery	Unsuitable: excessive fines.	Fair: medium strength
* Swantown: StB	Poor: gravelly	Poor to unsuitable: excessive fines; cemented below a depth of 18 to 24 inches.	Fair: somewhat poorly drained.
SuB, SwC For Alderwood part of SwC, see Alderwood series, unit AmC.	Poor: gravelly	Poor to unsuitable: excessive fines; cemented below a depth of 18 to 24 inches.	Fair: somewhat poorly drained.
Tealwhit: TEB	Poor: poorly drained	Unsuitable: fine grained.	Poor: poorly drained
Tidal marsh: Td. Too variable for valid estimates.			

interpretations of the soils Continued

Soil limitations for—				Soil features affecting—	
Septic-tank filter fields	Sewage lagoons	Local roads and streets	Dwellings without basements	Reservoir areas	Embankments, dikes, and levees
Severe: seasonal water table at a depth of 0 to 12 inches.	Severe: high organic-matter content; seasonal water table at a depth of 0 to 12 inches	Severe· very poorly drained, organic material.[1]	Severe: organic material, seasonal water table at a depth of 0 to 12 inches.[1]	Slow permeability, 0 to 2 percent slopes, seasonal water table at a depth of 0 to 12 inches.	High compressibility, pervious when compacted, organic material; seasonal water table at a depth of 0 to 12 inches.
Severe very slow permeability, slopes greater than 15 percent in places.	Moderate. 0 to 7 percent slopes, coarse fragments; perched water table. Severe· slopes greater than 7 percent.	Slight· 0 to 8 percent slopes Moderate: 8 to 15 percent slopes Severe· slopes greater than 15 percent.[1]	Moderate· 0 to 15 percent slopes, perched water table at a depth of 24 to 36 inches. Severe. slopes greater than 15 percent.[1]	Very slow permeability, 0 to 30 percent slopes; perched water table at a depth of 24 to 36 inches	Low compressibility, pervious when compacted, perched water table at a depth of 24 to 36 inches.
Severe: moderately slow permeability, slopes greater than 15 percent in places.	Moderate· 0 to 7 percent slopes, bedrock at a depth of 40 to 60 inches, coarse fragments. Severe: slopes greater than 7 percent.	Moderate. 0 to 15 percent slopes; moderate potential frost action; moderate shrink-swell potential. Severe· slopes greater than 15 percent.	Moderate: 0 to 15 percent slopes; moderate potential frost action; moderate shrink-swell potential. Severe: slopes greater than 15 percent.	Moderate permeability, bedrock at a depth of 40 to 60 inches; 0 to 30 percent slopes.	High compressibility, impervious when compacted.
Severe: seasonal water table at a depth of 0 to 12 inches.	Severe· high organic-matter content, seasonal water table at a depth of 0 to 12 inches.	Severe. poorly drained.[1]	Severe: high organic-matter content, seasonal water table at a depth of 0 to 12 inches.[1]	Moderate permeability, 0 to 2 cent slopes, seasonal water table at a depth of 0 to 12 inches.	High compressibility, pervious when compacted; organic soil deposits; seasonal water table at a depth of 0 to 12 inches.
Severe· slope	Severe: slope	Severe: slope	Severe slope	Moderate permeability, bedrock at a depth of 30 to 48 inches, 30 to 50 percent slopes.	Medium compressibility, semipervious when compacted.
Severe: very slow permeability; seasonal perched water table at a depth of 6 to 12 inches.	Severe: coarse fragments; seasonal perched water table at a depth of 6 to 12 inches.	Moderate· somewhat poorly drained.[1]	Severe: perched water table at a depth of 6 to 12 inches [1]	Very slow permeability, 0 to 8 percent slopes; perched water table.	Low compressibility; pervious when compacted, perched water table at a depth of 6 to 12 inches.
Severe: very slow permeability, seasonal perched water table at a depth of 6 to 12 inches.	Severe: coarse fragments; seasonal perched water table at a depth of 6 to 12 inches.	Moderate: somewhat poorly drained.[1]	Severe: perched water table at a depth of 6 to 12 inches [1]	Very slow permeability; 0 to 8 percent slopes, perched water table at a depth of 6 to 12 inches.	Medium compressibility, semipervious when compacted; perched water table at a depth of 6 to 12 inches.
Severe: slow permeability, seasonal water table at a depth of 0 to 6 inches.	Severe: high organic-matter content; seasonal water table at a depth of 0 to 6 inches.	Severe: poorly drained.[1]	Severe· seasonal water table at a depth of 0 to 6 inches.[1]	Moderate permeability below a depth of 42 inches; 0 to 8 percent slopes; seasonal water table at a depth of 0 to 6 inches.	High compressibility, seasonal water table at a depth of 0 to 6 inches.

TABLE 9.—*Engineering*

Soil series and map symbols	Suitability as source of—		
	Topsoil	Sand and gravel	Road fill
Tisch: Th	Poor: poorly drained	Unsuitable: fine grained.	Poor: poorly drained
Townsend. TlC	Good	Poor to unsuitable: excessive fines; cemented below a depth of 24 to 36 inches.	Good
TnC	Poor: gravelly	Poor to unsuitable: excessive fines; cemented below a depth of 24 to 36 inches.	Good
Triton: TrD, TrF	Poor: very gravelly	Poor to unsuitable: excessive fines; cemented below a depth of 12 to 20 inches.	Good
Tukey: TuC, TuD	Poor: gravelly	Unsuitable: excessive fines; cemented below a depth of 20 to 40 inches.	Fair: moderate shrink-swell potential, medium strength.
Wapato: Wa	Poor: poorly drained	Unsuitable: fine grained.	Poor: poorly drained
Whidbey: WhC, WhD	Poor: gravelly	Poor to unsuitable: excessive fines; cemented below a depth of 20 to 40 inches.	Good

[1] Subject to slight frost action during unusually cold winter periods.

interpretations of the soils—Continued

Soil limitations for—				Soil features affecting—	
Septic-tank filter fields	Sewage lagoons	Local roads and streets	Dwellings without basements	Reservoir areas	Embankments, dikes, and levees
Severe: seasonal water table at a depth of 6 to 18 inches.	Severe: high organic-matter content; seasonal water table at a depth of 6 to 18 inches.	Severe: poorly drained.[1]	Severe: seasonal water table at a depth of 6 to 18 inches.[1]	Moderately slow permeability, 0 to 2 percent slopes; seasonal water table at a depth of 6 to 18 inches.	Medium compressibility; semipervious when compacted; seasonal water table at a depth of 6 to 18 inches.
Severe: very slow permeability; seasonal perched water table at a depth of 18 to 30 inches.	Moderate. 0 to 7 percent slopes; high organic-matter content; coarse fragments; perched water table. Severe: slopes greater than 7 percent.	Slight: 0 to 8 percent slopes. Moderate. 8 to 15 percent slopes.[1]	Moderate perched water table at a depth of 18 to 30 inches.[1]	Very slow permeability; 0 to 15 percent slopes; perched water table.	Low compressibility, pervious when compacted; perched water table at a depth of 18 to 30 inches.
Severe: very slow permeability; seasonal perched water table at a depth of 18 to 30 inches.	Moderate: 0 to 7 percent slopes; high organic-matter content; coarse fragments; perched water table. Severe: slopes greater than 7 percent.	Slight: 0 to 8 percent slopes. Moderate: 8 to 15 percent slopes.[1]	Moderate: perched water table at a depth of 18 to 30 inches.[1]	Very slow permeability, 0 to 15 percent slopes; perched water table.	Low compressibility; pervious when compacted, perched water table at a depth of 18 to 30 inches.
Severe: very slow permeability; cemented pan at a depth of 12 to 20 inches over bedrock; slopes greater than 15 percent in places, seasonal perched water table at a depth of 12 to 18 inches.	Severe: coarse fragments, slopes greater than 7 percent in places.	Moderate. 0 to 15 percent slopes. Severe: slopes greater than 15 percent.[1]	Moderate: 0 to 15 percent slopes, perched water table at a depth of 12 to 18 inches. Severe: slopes greater than 15 percent.[1]	Very slow permeability; cemented pan at a depth of 12 to 20 inches over bedrock, 0 to 70 percent slopes.	Low compressibility, pervious when compacted; cemented pan at a depth of 12 to 20 inches over bedrock.
Severe: very slow permeability, slopes greater than 15 percent in places; seasonal perched water table at a depth of 18 to 30 inches.	Moderate: 0 to 7 percent slopes; coarse fragments; perched water table. Severe slopes greater than 7 percent.	Moderate: 0 to 15 percent slopes; moderate shrink-swell potential. Severe: slopes greater than 15 percent.[1]	Moderate: 0 to 15 percent slopes; moderate shrink-swell potential. Severe: slopes greater than 15 percent.[1]	Very slow permeability, 0 to 30 percent slopes; perched water table	Medium to high compressibility; semipervious to impervious when compacted, perched water table at a depth of 18 to 30 inches.
Severe: slow permeability, seasonal water table at a depth of 6 to 18 inches.	Severe: rapid permeability below a depth of 42 inches, high organic-matter content; seasonal water table at a depth of 6 to 18 inches.	Severe: poorly drained.[1]	Severe. seasonal water table at a depth of 6 to 18 inches.[1]	Rapid permeability below a depth of 42 inches; 0 to 3 percent slopes, seasonal water table at a depth of 6 to 18 inches.	High compressibility; impervious when compacted; seasonal water table at a depth of 6 to 18 inches.
Severe: very slow permeability; slopes greater than 15 percent in places.	Moderate: 0 to 7 percent slopes, coarse fragments. Severe. slopes greater than 7 percent.	Slight: 0 to 8 percent slopes. Moderate 8 to 15 percent slopes. Severe: slopes greater than 15 percent.	Slight: 0 to 8 percent slopes. Moderate: 8 to 15 percent slopes. Severe: slopes greater than 15 percent.	Very slow permeability, 0 to 30 percent slopes.	Low compressibility; pervious when compacted.

(5) the length of time the forces of soil formation have acted on the parent material.

Soils differ according to the relative degree of influence of each soil-forming factor. These factors and their influence on the soils of the Jefferson County Area are discussed in the following subsections.

Parent material

Parent material is the weathering mass of rock and organic materials in which a soil forms. There is a wide variety of parent material in the Jefferson County Area.

In eastern Jefferson County, most of the parent materials are composed of mixed glacial materials derived from two large glacial systems of 12,000 to 15,000 years ago: (1) The Olympic Glacier, which moved down from the Olympic mountains, and (2) the great Continental, or Vashon, Glacier. The Vashon Glacier moved through the mountains of Western Canada, bringing great quantities of medium- and coarse-textured gravelly and stony materials from as far as 500 miles away. The glacier not only brought material within and on top of its ice mass, which was deposited in the form of glacial drift, moraines, and outwash, but it shoved ahead of it, as it plowed through mountains, valleys, and across the Straits of Juan de Fuca and Puget Sound, great quantities of ground-up material. As this immense glacier merged with the Olympic Glacier, along the flanks of the northern and eastern Olympic Mountains, it built up a maximum thickness of about 3,000 feet. This great weight of ice resting on the thick layers of glacier material that it shoved ahead of it and then ran over, compressed and hardened it to form the thick, very compact, weakly cemented layers of glacial till that are common in many parts of the area today. The Alderwood, Clallam, Dabob, Hoodsport, Sinclair, Swantown, Townsend, Triton, Tukey, and Whidbey soils formed from these materials. These soils have a duripan at a depth of 10 to 40 inches. The duripan formed in the upper part of the very compact, weakly cemented glacial till. The material above the duripan is gravelly or cobbly. In most places the very compact, weakly cemented glacial till is many feet thick.

The duripan is cemented. The strongest cementation is in the upper part. Examinations of thin sections of the duripan reveal a very close packing of the soil particles and thin, discontinuous isotropic stringers between some particles. Compounds of iron and silica are the probable cementing agents.

The bulk of the heterogeneous parent materials are mainly acid-igneous in origin. These materials are derived principally from rocks such as granite, andesite, quartzite, schist, greywacke, and some sandstone, conglomerates, and shale. Gravelly and sandy deposits from 20 to 200 feet thick form outwash plains. The Carlsborg, Dick, Everett, Grove, Hoypus, Indianola, and San Juan soils formed in these materials.

The Olympic Glacier materials were deposited in the mountain foothills mainly along Hood Canal, at elevations of about 200 to 3,000 feet, and for the most part mixed with Continental glacial materials. Although the parent rock material from the Olympic Glacier is also varied, it is dominated by basalt. Many of the nearly level to gently undulating, low terraces consist of glacial sediment from the Olympic mountains, laid down in glacial lakes or marine deposits. This sediment, much of which contains glacial silt, is stratified. In most places it is many feet thick. The Agnew, Cassolary, Casey, Kitsap, and Lummi soils formed in these materials.

Other parent materials in the eastern part of this survey area are residuum from bedrock. These areas of bedrock occur mainly below an elevation of 800 feet, have escaped most of the glacial overburden, and are quite scattered. Several thousand acres of soils that formed in residuum from basalt are mostly in the Discovery Bay, Ludlow Bay, and Hood Canal areas. Sedimentary bedrock consisting mostly of sandstones, conglomerates, and shales is not only interbedded among some of these old basalt flows uplifted from the sea bottom, but also in large separate bodies on or near the surface in many areas. These areas are mainly on parts of Indian and Marrowstone Islands and along Oak Bay, Discovery Bay, Dabob Bay, Quilcene, Penny Creek, Hood Canal, and along parts of the Dosewallips, Duckabush, and Big Quilcene River valley side slopes. The Ahl and Olete soils formed in basaltic materials and the Beausite, Cathcart, and Quilcene soils formed in sandstone and shale.

The Belfast and Tisch soils formed in recent alluvium along the major streams. The Tisch soils are high in volcanic ash and diatomaceous earth. Some areas of Wapato soils also formed in recent alluvium, but most of the acreage formed in glaciofluvial sediment. The McMurray, Mukilteo, and Semiahmoo soils formed in deposits of fibrous and woody materials in poorly drained basins. Parts of the Snohomish soils are derived from alluvium and parts from organic deposits.

In the western part of the Area the parent material consists of weathered sandstones, conglomerates, and shale at the higher elevations, Olympic glacial till in the intermediate positions, glaciofluvial or marine sediments on the ocean bluffs, and recent alluvium along the major streams. The Dimal, Snahopish, and Solleks soils formed from the weathering of the sandstones in place.

The Olympic glacial till consists of material from sandstone, shale, and conglomerate rock carried off the Olympic mountains by the glacier. The Hoko, Itswoot, Klone, and Phelan soils formed in this material. The Calawah, Kalaloch, Queets, and Tealwhit soils formed in finer textured glacial materials laid down in lakes or marine deposits and elevated as much as 600 feet above sea level. The Hoh, Huel, and Sekiu soils formed in recent alluvium along the major streams.

Climate

In the Jefferson County soil survey area there are three distinct climatic zones.

In the northern part of the survey area, in the vicinity of Port Townsend, the annual precipitation ranges from 17 to 30 inches, and there are as many as 250 frost-free days per year. The soils range in color from grayish brown to black. Soil reaction ranges from medium acid to neutral. The Agnew, San Juan, and Townsend soils are representative of this area.

South of this area the annual precipitation ranges from 30 to 100 inches with 160 to 200 frost-free days. In this area the potential evapotranspiration is less than the precipitation. Soils can have up to 20 or 30 inches of surplus water. These soils undergo considerable leaching. A large part of the bases have been removed. Representative soils in this rainfall area are Alderwood, Everett, and Triton series.

The western part of the Area has an annual precipitation ranging from 100 inches at the Pacific Ocean to about 180

inches in the Olympic Mountain foothills. This is locally referred to as "Rain Forest Country." With an evapotranspiration rate of 24 inches at Forks (just north of the Area) and 25 inches at Quinault (just south of the Area), the soils are apparently subject to leaching by more than 100 inches of water per year. The soils are very low in bases. Soil reaction is dominantly medium acid to very strongly acid. These soils have an organic layer ranging in thickness from 2 inches on the very steep slopes to 4 inches on the gently sloping areas. The Kalaloch, Tealwhit, Klone, Phelan, Solleks, and Dimal soils are representative of this area.

Relief

The relief or topography of the landscape affects soil formation through its influence on drainage, erosion, plant cover, soil temperatures, and the microclimate of the soil. Elevation, slope, and aspect are the important elements of relief in the survey area. Slopes in the survey area range from nearly level to very steep.

In the survey area, precipitation generally increases and temperatures decrease with increase in elevation. Along the rainy Pacific coast the prevailing westerly winds and storm systems drop their precipitation in almost direct proportion to elevation. However, eastern Jefferson County is in the rain shadow of the Olympic Mountains and rainfall patterns vary considerably. In the comparatively dry belt of the Quimper peninsula, elevations are generally less than 400 feet; and since this area is several miles north of the high mountain country, it receives much less annual precipitation than areas of Hood Canal that are close to the high mountain country Slopes with southern exposures in the eastern part of the Area generally grow a somewhat different climax vegetative sequence than do slopes with northerly exposures. This is due to the lower effective precipitation, through greater evaporation and transpiration. However, in the Rain Forest areas, heavy precipitation offsets the effects of exposure or aspect, and differences in slope gradient or aspect have very little effect on soil development. Because of sparse vegetative growth, soils that have steep to very steep slopes in the eastern part of the Area are subject to more rapid runoff and more geologic erosion than soils on comparative slopes in the western part of the Area. In this area, particularly at elevations above 1,200 feet where most of the soils have developed in place from bedrock, the shallower soils have the steeper slopes. This is also true in the western part of the Area, but because of the more intense weathering action, soils on similar slopes are generally deeper to bedrock than in the eastern part of the Area. The colors of the well-drained, moderately steep to very steep soils are generally in shades of brown, red, and yellow. The gently sloping soils are mostly dark brown and dark yellowish brown. These soils are generally not as well drained and have slower runoff. The level to nearly level soils on alluvial bottoms or in depression areas are poorly aerated where water stands for long periods or drains away slowly. This causes the reduction of certain elements, particularly iron, and results in the formation of dark-gray, dark greenish-gray, or greenish-gray colors. Temporarily perched high water tables also cause the precipitation of varying amounts of reddish-brown, granular iron oxide. This often accumulates in hard lenses and restricts water and root penetration.

Living organisms

Plants, animals, earthworms, insects, bacteria, and fungi are important in soil formation. All contribute significantly by adding organic matter, nitrogen, and other important plant nutrients. Plant roots penetrate the earth mantle and improve aeration and permeability of the soil. Plants also intercept runoff and help reduce erosion.

Plant life in this area probably has a greater effect on soil formation than animals. In most parts of the Jefferson County Area, under natural conditions, a lush forest vegetation grows; most of the Area is still under forest. In both the eastern and western parts, the dominant forest trees are conifers. In the moderately well drained to somewhat poorly drained areas, native vegetation is mixed coniferous and hardwood-deciduous. In these areas a greater accumulation of organic material generally results in a thicker and darker-colored surface layer. In the wetter areas, excluding peat bogs, the dominant vegetation consists of deciduous trees and shrubs, and numerous annual and perennial plants, sedges, and grasses. In these areas of vegetative growth, the heavy accumulation of organic matter results in a thicker and darker surface layer. Although there is a much greater accumulation of organic forest litter on the surface of the soils in the western part of the Area than the eastern part, the amount of organic humus incorporated in the surface layer of the eastern part, under similar vegetative, topographic, and drainage conditions, is much the same. The soils that have the thickest and blackest A horizons have formed under bunchgrass vegetation. These horizons occur in the San Juan and Townsend soils in the comparatively dry sections of the northern Quimper peninsula, mostly in the Port Townsend area, and are 15 to 24 inches thick.

Burrowing animals of many kinds, particularly mountain beaver, mole, mice, fox, coyote, not only help in adding organic materials to the soil, but aid in bringing subsoil nutrients to the surface. These nutrients replace those that have been either leached out of the surface layer or were used by growing vegetation. They also help in soil drainage and aeration.

Earthworms, insects, bacteria, and fungi are also important agents in soil formation. They all help in various ways, through their bodily processes, to transpose organic compounds and other important soil elements into more usuable forms that plants can use readily. They also aid in soil aeration and in forming rich, friable surface layers with granular structure.

Time

Soils of the Jefferson County Area range in age from those that are very young and have very little profile development to those that are very old and have well-defined horizons. The Hoh, Kalaloch, Belfast, and Indianola soils are good examples of soils with very little development. Examples of soils that have well-defined horizons are Sekiu, Tealwhit, Wapato, and Casey. These have strong structural development in the B horizons and gley colors in the C horizons.

The texture of the parent material is also a very important factor in soil development. Soils formed in sandy material, especially if it contains much gravel, develop structure much slower than soils formed in clayey material.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relation-

ship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and revised later (*8*). The system currently used by the National Cooperative Soil Survey was developed in the early sixties (*7*) and adopted in 1965 (*10*). It is under continual study.

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped together. In table 10, the soil series of the Jefferson County Area are placed in 6

TABLE 10.—*Soil series classified according to the current system of classification*

Series	Family	Subgroup	Order
Agnew	Fine-silty, mixed, mesic	Typic Ochraqualfs	Alfisols.
Ahl	Loamy-skeletal, mixed, mesic	Typic Haplorthods	Spodosols.
Alderwood	Loamy-skeletal, mixed, mesic	Dystric Entic Durochrepts	Inceptisols.
Beausite	Loamy-skeletal, mixed, mesic	Dystric Xerochrepts	Inceptisols.
Belfast	Coarse-loamy, mixed, nonacid, mesic	Typic Udifluvents	Entisols.
Belfast, heavy variant	Fine-loamy, mixed, nonacid, mesic	Typic Udifluvents	Entisols
Belfast, wet variant	Coarse-loamy, mixed, nonacid, mesic	Aquic Udifluvents	Entisols.
Calawah	Fine-silty, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Carlsborg	Sandy-skeletal, mixed, mesic	Typic Xerothents	Entisols.
Casey	Fine, mixed, mesic	Typic Albaqualfs	Alfisols.
Cassolary	Fine-loamy, mixed, mesic	Typic Xerochrepts	Inceptisols.
Cathcart	Loamy-skeletal, mixed, mesic	Dystric Xerochrepts	Inceptisols.
Clallam	Loamy-skeletal, mixed, mesic	Entic Durochrepts	Inceptisols.
Dabob	Loamy-skeletal, mixed, mesic	Dystric Entic Durochrepts	Inceptisols.
Dick	Mixed, mesic	Alfic Xeropsamments	Entisols
Dimal	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols.
Everett	Loamy-skeletal, mixed, mesic	Dystric Xerochrepts	Inceptisols.
Grove	Sandy-skeletal, mixed, mesic	Dystric Xerorthents	Entisols.
Hoh	Coarse-loamy, mixed, acid, mesic	Typic Udifluvents	Entisols.
Hoko	Fine-loamy, mixed, mesic	Dystric Entic Durochrepts	Inceptisols.
Hoko, wet variant	Fine-loamy, mixed, acid, mesic	Typic Haplaquepts	Inceptisols.
Hoodsport	Loamy-skeletal, mixed, mesic	Dystric Entic Durochrepts	Inceptisols.
Hoypus	Sandy-skeletal, mixed, mesic	Typic Xerorthents	Entisols.
Huel	Sandy-skeletal, mixed, mesic	Typic Udifluvents	Entisols.
Indianola	Mixed, mesic	Dystric Xeropsamments	Entisols.
Itswoot	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Kalaloch	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Dystrochrepts	Inceptisols.
Kitsap	Fine-loamy, mixed, mesic	Dystric Xerochrepts	Inceptisols.
Klone	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Lummi	Fine, silty, mixed, mesic	Fluvaquentic Haplaquolls	Mollisols.
Lystair	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Haplorthods	Spodosols.
McMurray	Euic, mesic	Typic Medihemists	Histosols.
Mukilteo	Euic, mesic	Typic Medihemists	Histosols.
Olete	Loamy-skeletal, mixed, mesic	Typic Xerochrepts	Inceptisols.
Phelan	Loamy-skeletal, mixed, mesic, shallow	Dystric Entic Durochrepts	Inceptisols.
Queets	Fine-silty, mixed, mesic	Fluvaquentic Dystrochrepts	Inceptisols.
Quilcene	Fine, mixed, mesic	Aquic Dystric Xerochrepts	Inceptisols.
San Juan	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic.	Pachic Xerumbrepts	Inceptisols.
Sekiu	Very fine kaolinitic, acid, mesic	Humic Haplaquepts	Inceptisols.
Semiahmoo	Euic, mesic	Typic Medisaprists	Histosols.
Sinclair	Loamy-skeletal, mixed, mesic	Dystric Entic Durochrepts	Inceptisols.
Snahopish	Fine, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Snohomish	Fine, mixed, nonacid, mesic	Thapto-Histic Fluvaquents	Inceptisols.
Solleks	Loamy-skeletal, mixed, mesic	Typic Haplumbrepts	Inceptisols.
Swantown	Loamy-skeletal, mixed, mesic	Entic Durochrepts	Inceptisols.
Tealwhit	Fine, mixed, acid, mesic	Aeric Haplaquepts	Inceptisols.
Tisch	Medial, nonacid, mesic	Andaqueptic Fluvaquents	Entisols.
Townsend	Loamy-skeletal, mixed, mesic	Entic Durixerolls	Mollisols.
Triton	Loamy-skeletal, mixed, mesic, shallow	Duric Haplorthods	Spodosols.
Tukey	Loamy-skeletal, mixed, mesic	Entic Durochrepts	Inceptisols.
Wapato	Fine-silty, mixed, mesic	Fluvaquentic Haplaquolls	Mollisols.
Whidbey	Loamy-skeletal, mixed, mesic	Entic Durochrepts	Inceptisols.

categories of the current system. Categories of the current system are briefly defined in the following paragraphs.

ORDER. Ten soil orders are recognized The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. The two exceptions to this are the Entisols and Histosols, which occur in many different climates.

SUBORDER. Each order is subdivided into suborders that are based primarily on those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation.

GREAT GROUP. Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and thick, dark-colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), dark-red and dark-brown colors associated with basic rocks, and the like.

SUBGROUP. Great groups are subdivided into groups, one representing the central (typic) segment of the group, and others called intergrades that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order.

FAMILY. Soil families are separated within a subgroup primarily on the basis of properties important to the growth of plants or on the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. An example is the coarse-loamy, siliceous, acid, thermic family of Typic Haplaquents.

SERIES. A series is a group of soils that formed from a particular kind of parent material and have genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile. An example is the Calawah series.

Climate[5]

The climate of Jefferson County is a mid-latitude, west coast marine type with comparatively cool, dry summers and mild but wet and cloudy winters. There are distinct differences between the climate on the windward and leeward slopes of the mountains and between the alpine areas in the higher elevations and the coastal plains. The section along the western slope of the Olympic Mountains lies in the heaviest precipitation belt in the continental United States. In contrast, the northeastern corner is located in a part of the driest area of western Washington. With much of the county close to the ocean, temperatures show small diurnal and day-to-day change.

In late fall and winter, storm centers crossing the north Pacific follow a more southerly path, striking coastal areas at frequent intervals. The prevailing wind is southwesterly or westerly. Air reaching the coast is moist and near the temperature of the ocean surface. The air cools and condenses as it moves inland and rises along the windward or southwestern slopes of the mountains. In the "rain forest" area of western Jefferson County, monthly precipitation during December and January ranges from 18 to 25 inches and has reached 40 to 50 inches. Warming and drying of the air as it descends along the leeward or northeastern slopes of the mountains produces a small dry belt frequently referred to as the rain shadow of the Olympic Mountains. In the "rain forest," the rainy season begins in late August or September, reaching a peak in December and January, then decreasing in the spring with a sharp drop near the end of June. Table 11 gives probabilities of freezing temperatures in spring and fall, and tables 12, 13, and 14 give temperature and precipitation data

During an average winter, afternoon temperatures in the lower elevations are in the 40's and nighttime readings are in the 30's. Occasionally an outbreak of cold arctic air and strong northerly winds reach the Olympic Peninsula, resulting in maximum temperatures from 15° to 20° and minimum from zero to 10°. Within a few days, the colder air is replaced by warmer marine air. Frequently, in the foothills and mountains, snowfall is heavy as the warmer moist air moves inland.

In summer, a clockwise circulation of air brings a prevailing northwesterly and westerly flow of cool, comparatively dry, stable air into Jefferson County. Warming and drying of the air as it moves inland results in a dry season beginning in April in the lower elevations along the northeastern slope of the Olympia Range. In the "rain forest," the dry season begins in late May or June with the driest period between mid-July and mid-August. On a few days each summer, small electrical storms develop above the higher ridges and forest fires are started by lightning.

During the warmest summer months, afternoon temperatures along the coast are in the upper 60's Near the foothills the temperatures are in the 70's. In the mountains the temperatures can be expected to decrease approximately three degrees Fahrenheit with each 1000-foot increase in elevation. The Cascade Range shields the Olympic Peninsula from the higher summer and lower winter temperatures observed in eastern Washington. The temperature of the water along the coast varies from 48° in February and March to 58° in August.

Frequently during the latter half of the summer and fall, fog banks or low clouds form at night and dissipate by midday. The higher elevations are often clear while the lower valleys and coastal plains are covered by fog or low clouds.

In the lower elevations near the ocean, annual precipitation ranges from 80 to 120 inches, increasing to 150 inches or more along the southwestern slopes of the mountains. Along the eastern and northeastern slopes of the mountains, annual precipitation gradually decreases to approximately 55 inches in lower elevations along Hood Canal to less than 20 inches in the vicinity of Port Townsend. Due to topography and location, precipitation can show marked changes within short distances.

Most of the winter precipitation falls as rain in elevations below 1,500 feet, as rain and snow between 1,500 and 3,000

[5] By EARL L. PHILLIPS, climatologist for Washington, National Weather Service, U.S. Department of Commerce.

TABLE 11.—*Probability of last freezing temperatures in spring and first in fall*

Probability	Dates of given probability and temperature		
	32° F or lower	28° F or lower	24° F or lower
Forks 1E:			
Spring—			
1 year in 10 later than	May 18	Apr. 13	Mar. 17
1 year in 4 later than	May 6	Apr. 1	Mar. 4
1 year in 2 later than	Apr. 22	Mar 19	Feb. 15
Fall—			
1 year in 10 earlier than	Sep. 25	Oct 21	Nov. 10
1 year in 4 earlier than	Oct. 6	Oct. 31	Nov. 23
1 year in 2 earlier than	Oct 18	Nov. 13	Dec. 12
Average number of days in growing season	179	239	300
Port Townsend:			
Spring—			
1 year in 10 later than	Apr. 6	Feb. 28	Feb. 17
1 year in 4 later than	Mar. 25	Feb. 14	Feb. 4
1 year in 2 later than	Mar. 12	Jan. 29	Jan. 19
Fall—			
1 year in 10 earlier than	Nov. 2	Nov. 20	Dec. 6
1 year in 4 earlier than	Nov. 13	Dec. 2	Dec. 25
1 year in 2 earlier than	Nov. 25	Dec. 19	
Average number of days in growing season	258	324	346
Quilcene 2SW:			
Spring—			
1 year in 10 later than	May 26	Apr. 26	Mar 26
1 year in 4 earlier than	May 14	Apr. 14	Mar. 13
1 year in 2 earlier than	Apr. 30	Mar. 31	Feb. 26
Fall—			
1 year in 10 earlier than	Sep. 15	Oct. 9	Nov. 7
1 year in 4 earlier than	Sep. 26	Oct. 20	Nov. 18
1 year in 2 earlier than	Oct. 8	Nov. 1	Dec. 1
Average number of days in growing season	161	215	278

TABLE 12.—*Temperature and precipitation data for Forks 1E*

[Period of record: 1931-60. Elevation: 350 feet]

Month	Temperature				Precipitation			
			Two years in 10 will have at least 4 days with—			One year in 10 will have—		
	Average daily maximum	Average daily minimum	Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—	Average total	Less than—	More than—	Average snowfall
	°F	°F	°F	°F	In	In.	In	In
January	45	33	53	20	17.5	7.4	25.6	6.2
February	47	33	56	24	14.1	8.7	22.6	2.9
March	50	35	61	25	12.7	5.8	17.8	3.3
April	56	38	70	26	8.3	2.3	13.1	(1)
May	62	42	77	34	4.9	1.4	10.5	
June	66	46	79	39	3.7	.8	8.3	
July	70	49	85	42	2.5	.3	5.4	
August	71	49	83	42	2.3	.5	4.7	
September	68	47	82	38	5.1	2.1	10.5	
October	60	43	72	33	11.7	6.5	18.7	
November	51	37	62	26	15.1	6.2	24.3	.5
December	46	35	53	24	19.2	12.1	27.6	1.8
Annual	58	41			117.1	92.8	140.9	14.7

[1] Trace.

TABLE 13.—*Temperature and precipitation data for Port Townsend*

[Period of record: 1931-60. Elevation: 65 feet]

Month	Temperature				Precipitation			
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average total	One year in 10 will have—		Average snowfall
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—	
	°F	°F	°F	°F	In	In	In	In
January	44	34	53	21	2.2	.8	3.6	1.2
February	47	36	55	28	1.7	.7	2.9	.8
March	51	38	59	30	1.6	.8	2.6	.4
April	57	42	66	35	1.1	.5	2.0	(1)
May	63	46	73	40	1.4	.4	2.6	
June	67	49	77	44	1.4	.1	3 2	
July	71	51	83	47	.7	.1	1.7	
August	71	51	81	46	.7	.1	1.5	
September	67	49	77	43	1.1	.4	2.4	
October	59	45	67	38	1.7	.6	2.7	(1)
November	50	40	58	29	2.4	1.0	4.0	.3
December	46	38	54	29	2.4	1.1	3.9	.2
Annual	58	43			18.4	13.0	21.6	2.9

[1] Trace.

feet, and as snow in the higher elevations. Winter snowfall ranges from 10 to 30 inches over the coastal plains to between 250 to 500 inches in the mountains. The higher elevations are covered with snow from November until June, with depths ranging from 10 to 15 feet. Over the coastal plains, snow seldom reaches a depth in excess of 15 inches or remains on the ground longer than two weeks.

In the coastal areas, wind velocities ranging from 50 to 70 mph are recorded every winter as the more intense storms move inland and winds of 90 mph or more can be expected at least once in 50 years. The strongest winds are from the south or southwest. As winter storms approach the coast, it is not unusual to have a southwesterly gale along the coast, and at the same time, strong easterly winds through the

TABLE 14.—*Temperature and precipitation data for Quilcene 2SW*

[Period of record: 1931-60. Elevation: 123 feet]

Month	Temperature				Precipitation			
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average total	One year in 10 will have—		Average snowfall
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—	
	°F	°F	°F	°F	In	In	In	In
January	44	29	56	16	8.1	2.6	15.0	3.6
February	49	31	59	23	6.5	2.2	11.7	1.4
March	54	33	65	27	4.4	1.2	8.2	.7
April	61	37	71	29	3.1	1.0	5.4	
May	68	42	83	34	2.5	.7	5.3	
June	72	47	84	40	2.4	.8	4.7	
July	77	50	91	42	1.0	.1	2.2	
August	77	49	89	42	1.0	.2	2.6	
September	72	45	87	37	1.5	.2	3.1	
October	62	40	73	31	3.8	1.1	8.5	
November	51	34	61	23	7.3	2.3	13.8	1.0
December	46	32	56	22	9.4	3.4	18.6	.6
Annual	61	39			51.0	34.1	63.8	7.5

Strait. Easterly winds reach velocities of 40 to 50 mph almost every winter. In the area along Hood Canal and Puget Sound, the strongest winds are from a southeasterly to southwesterly direction and velocities reach 40 to 60 mph almost every winter Occasionally, strong northeasterly winds strike this section. On most summer afternoons, a moderate to fresh westerly breeze can be expected in the Strait and along the ocean beaches.

Water Supply

All existing municipal water supply systems are located in eastern Jefferson County. Approximately 65 percent of the population of this area, in addition to the Crown Zellerbach Corporation Mill, is presently served by the City of Port Townsend gravity supply line.

Potential domestic and irrigation water from other streams and rivers in Eastern Jefferson that are being considered for future requirements include Snow and Andrews Creeks and the Dosewallips and Duckabush Rivers. The Dosewallips is the largest river in the area and is also one of the county's best spawning rivers for salmon and steelhead.

At present, the potential supplies of ground water are unknown. An increasing use of and dependence upon ground water sources for both irrigation and domestic consumption in recent years make it apparent that this resource will require critical analysis and rapidly increasing development. Ground water is obtained from both shallow, dug wells and deep, drilled wells. It occurs principally in the void spaces of glacial and alluvial deposits in this area but can occur in bedrock, where it sometimes is in faults, contacts, and fracture zones.

Ground water reservoirs or aquifers are most extensive in the westerly and northerly sections of Chimacum Valley, particularly the Tri-City area. Numerous drilled wells in these areas produce heavily; but most of the water from them contains heavy concentrations of iron and manganese, which makes much of this water less desirable for drinking and washing. Its degree of hardness ranges from hard to excessively hard because of its high concentration of calcium and magnesium.

Moderate ground water reservoirs occur in the Mats-Mats-Ludlow area, the Quilcene area, and the Uncas-Discovery Bay area. Water from these areas has moderate to high iron and manganese concentrations and ranges from soft to moderately hard.

Numerous springs scattered throughout East Jefferson provide good and adequate supplies of potable water to many rural homes and small communities. In some of the more extensive areas, such as Toandos Peninsula and Marrowstone Island, where ground water reservoirs are lacking, spring water supplies most of the domestic needs.

Additional information about water supplies is available through various secondary sources (4).

Water supplies for western Jefferson County, for the present, are more than adequate in most areas. The few people living in this part of the Area reside mostly along the broad river bottoms where potable water is readily available from rivers, streams, springs, or shallow wells. Flowing water is usually soft and free from heavy concentrations of iron and manganese. However, some stream water flowing through cedar swamps contains a high concentration of organic matter, which makes it undesirable for drinking.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable

Plastic—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

Diatomaceous earth. Accumulations of the siliceous capsules or skeletons of diatoms, which are minute, one-celled organisms. The accumulations are composed mainly of light-gray to white silica that is highly porous.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile

Duripan. A subsurface horizon that is cemented by silica and accessory iron oxide to the point that fragments from the air-dry horizon will not slake after prolonged soaking in water or hydrochloric acid. It is extremely hard when dry and extremely firm and brittle when moist. It is very slowly permeable to water, and roots penetrate the duripan only through cracks. In Jefferson County Area, the duripan grades to very compact, weakly cemented glacial till. The horizon designation for the duripan in the profile descriptions is Csim.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick, they generally occur below the B horizon, 15 to 40 inches below the surface.

Glacial outwash (geology) Cross-bedded gravel, sand, and silt deposited by melt water as it flowed from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Green manure (agronomy). A crop grown for the purpose of being turned under in an early stage of maturity or soon after maturity for soil improvement.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons.

O horizon. The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure, (3) by redder or stronger colors than the A horizon; or (4) by some combination of these Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Lacustrine deposit (geology). Material deposited in lake water and exposed by lowering of the water level or by elevation of the land.

Mineral soil. Soil composed mainly of inorganic (mineral) material and low in content of organic material. Its bulk density is greater than that of organic soil.

Miscellaneous land type. A mapping unit for areas of land that have little or no natural soil, or that are too nearly inaccessible for orderly examination, or that occur where, for other reasons, it is not feasible to classify the soil

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows. Abundance—*few, common,* and *many,* size—*fine, medium,* and *coarse,* and contrast—*faint, distinct,* and *prominent.* The size measurements are these *fine,* less than 5 millimeters (about 0 2 inch) in diameter along the greatest dimension, *medium,* ranging from 5 millimeters to 15 millimeters (about 0 2 to 0 6 inch) in diameter along the greatest dimension, and *coarse,* more than 15 millimeters (about 0 6 inch) in diameter along the greatest dimension.

Muck. An organic soil consisting of fairly well decomposed organic material that is relatively high in mineral content, finely divided, and dark in color

Organic soil. A general term applied to a soil or to a soil horizon that consists primarily of organic matter, such as peat soils, muck soils, and peaty soil layers. In chemistry, organic refers to the compounds of carbon.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape A soil series, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

pH value. A numerical means for designating acidity and alkalinity in soils A pH value of 7.0 indicates precise neutrality, a higher value, alkalinity, and a lower value, acidity.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity

are expressed thus:

	pH		*pH*
Extremely acid	Below 4 5	Neutral	6.6 to 7.3
Very strongly acid	4 5 to 5 0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8 4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9 0
Slightly acid	6 1 to 6 5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0 002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Site index. A numerical means of expressing the quality of a forest site that is based on the height of the dominant stand at an arbitrarily chosen age; for example, the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon, roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

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SOIL ASSOCIATIONS

SLIGHTLY ACID TO STRONGLY ACID SOILS

1. Triton-Hoodsport association: Moderately well drained, nearly level to very steep, very gravelly soils underlain by compact glacial till or basalt
2. Quilcene-Alderwood-Cathcart association: Moderately well drained and well drained, nearly level to very steep soils underlain by shale, sandstone, or compact glacial till
3. Clallam-Hoypus-Dick association: Well drained and somewhat excessively drained, nearly level to very steep soils underlain by compact glacial till, loamy sand and gravel, or gravelly sand
4. Semiahmoo-McMurray-Mukilteo association: Very poorly drained, nearly level organic soils
5. Alderwood-Sinclair association: Moderately well drained, dominantly strongly sloping to steep, gravelly soils underlain by compact glacial till
6. Olete-Hoodsport association: Well drained and moderately well drained, dominantly strongly sloping to steep, very gravelly soils underlain by basalt or compact glacial till
7. Whidbey-Dick association: Well drained and somewhat excessively drained, undulating to hilly, gravelly and sandy soils underlain by compact glacial till or loamy sand

STRONGLY ACID AND VERY STRONGLY ACID SOILS

8. Dimal-Solleks-Snahopish association: Somewhat excessively drained and well drained, moderately steep to very steep, dominantly flaggy and channery soils underlain by weathered sandstone and shale
9. Hoko-Klone-Calawah association: Moderately well drained and well drained, undulating to hilly, mostly gravelly soils, some of which are underlain by compact glacial till or marine sediments
10. Queets-Kalaloch-Huel association: Moderately well drained and well drained, mostly nearly level, loamy and sandy soils of flood plains

N

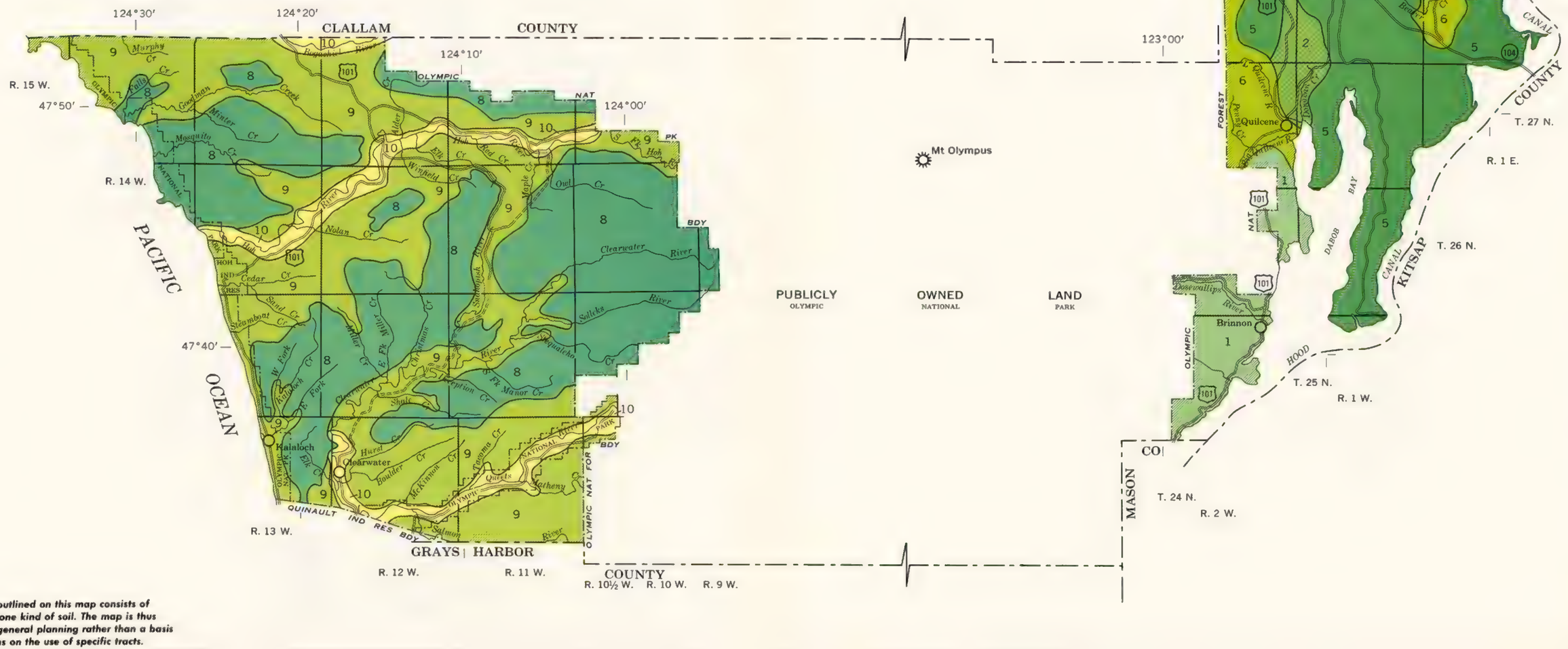
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
WASHINGTON AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

JEFFERSON COUNTY AREA, WASHINGTON

Scale 1:316,800
1 0 1 2 3 4 5 Miles

Compiled 1972



Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

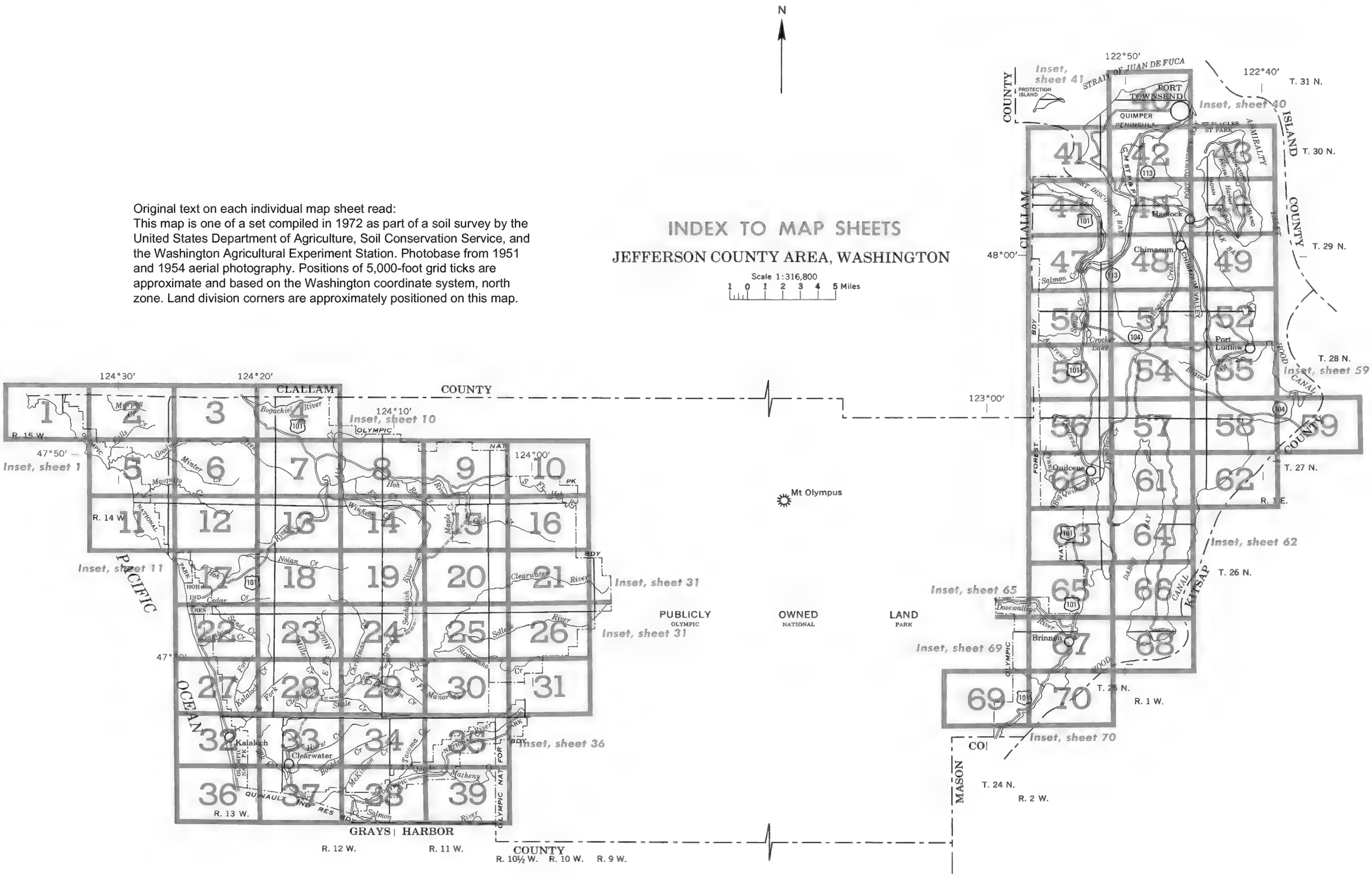
Original text on each individual map sheet read:
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Washington Agricultural Experiment Station. Photobase from 1951 and 1954 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Washington coordinate system, north zone. Land division corners are approximately positioned on this map.

INDEX TO MAP SHEETS

JEFFERSON COUNTY AREA, WASHINGTON

Scale 1:316,800

1 0 1 2 3 4 5 Miles



10

N

1 Mile 5000 Feet

0 0

Scale 1:20000

1000 2000 3000 4000 5000

¼ ½ ¾ 1

1 235 000 FEET

1 185 000 FEET

332 000 FEET

320 000 FEET

T. 27 N.

(Joins sheet 4)

LIMIT OF SOIL SURVEY OLYMPIC

NATIONAL PARK BOUNDARY

DMF SSE HLE KGD KGF ITD PHE KND PHF HW RW

Alder Creek

South Fork HOH RIVER

10 11 14 15 13 18 27 28 29 32 33 34 35

1 327 000 FEET

1 310 000 FEET

1 170 000 FEET

1 215 000 FEET

(Joins sheet 8)

(Joins sheet 9)

(Joins sheet 16)

R. 12 W. R. 11 W.

R. 10 W.

JEFFERSON COUNTY AREA, WASHINGTON — SHEET NUMBER 11

1 095 000 FEET

310 000 FEET

(Joins sheet 5)

R. 14 W. | R. 13 W.

T. 27 N.

T. 26 N.

(Joins sheet 12)

300 000 FEET

1 115 000 FEET

(Joins inset)

N

1 Mile

5000 Feet

Scale 1:20000

1 110 000 FEET

(Joins lower right)

295 000 FEET

290 000 FEET

(Joins sheet 17)

PACIFIC OCEAN

OLYMPIC NATIONAL PARK

HOH RIVER

Hoh Head

35 36 31 2 1 6 11 12 7 13 18

TEB SSE CND CW RY CVB CGB DMF HIR HIK HH

N

1 Mile 5000 Feet

0 0

Scale 1:20000

¼ 1000 2000

½ 3000

¾ 4000

1 5000

(Joins sheet 6)

R. 13 W.

1 140 000 FEET

310 000 FEET

T. 27 N.

T. 26 N.

(Joins sheet 11)

(Joins sheet 13)

300 000 FEET

1 120 000 FEET

(Joins sheet 17)

31 32 33 34 35

6 5 4 3 2

7 8 9 10 11

18 17 16 15 14

Mosquito Creek

Hoh Peak

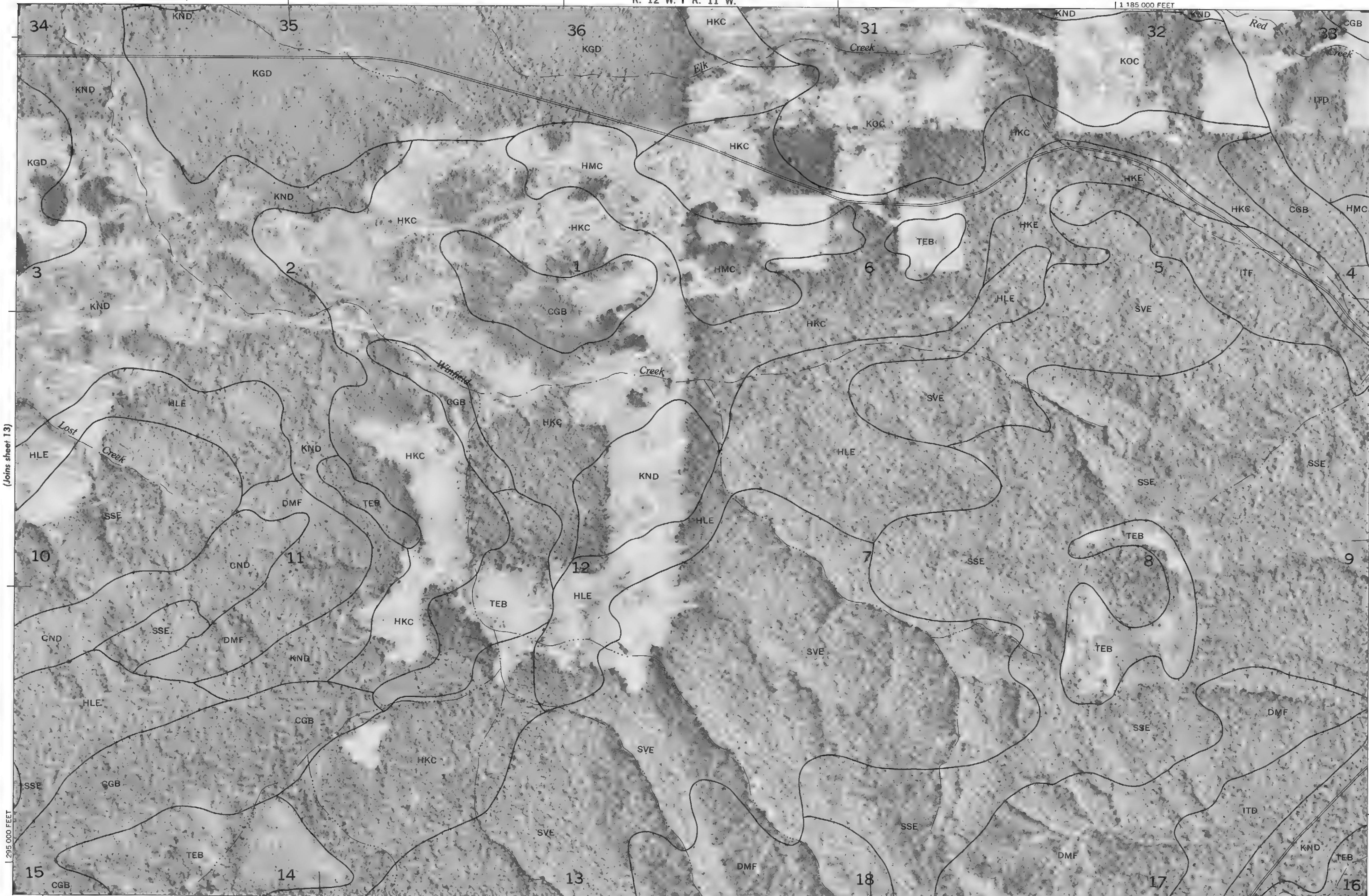
Fossil Creek

Lacy Oil Seep

HOH RIVER

CVB CGB KND SVE DMF SSE HLE TEB HMC HKC HKE CND KAB QT RW HW

13
R. 13 W. | R. 12 W.
1 145 000 FEET
(Joins sheet 7)
T. 27 N. | T. 26 N.
310 000 FEET
(Joins sheet 12)
(Joins sheet 14)
(Joins sheet 18)
1 160 000 FEET
295 000 FEET
N
1 Mile
5 000 Feet
0
1000
2000
3000
4000
5000
¼
½
¾
1
Scale 1:20000
36
31
32
33
34
1
6
5
4
3
12
7
8
9
10
13
18
17
16
15
HOH RIVER
HOH R.
Anderson Creek
Lost Creek
Pins Creek
101
SSE
DMF
CGB
HKE
PHF
HKC
KAB
QT
HW
RW
TEB
KND
HH
KCC
HKD
SVE
KGD
HLE
CND


N
(Joins sheet 8)
R. 12 W. | R. 11 W.
1 185 000 FEET
T. 27 N. | T. 26 N.
305 000 FEET
(Joins sheet 13)
(Joins sheet 15)
295 000 FEET
1 165 000 FEET
(Joins sheet 19)
Scale 1:20000
1 Mile
5000 Feet
0
¼
½
¾
1
1000
2000
3000
4000
5000
34
35
36
31
32
33
3
2
1
6
5
4
10
11
12
7
8
9
15
14
13
18
17
16
Elk
Creek
Red
Creek
Winfield
Creek
Lost
Creek
KND
KGD
HKC
KOC
CGB
ITD
HMC
HKE
TEB
ITF
SVE
HLE
SSE
DMF
CND

JEFFERSON COUNTY AREA, WASHINGTON — SHEET NUMBER 15

15

N

1 190 000 FEET

(Joins sheet 9)

R. 11 W. | R. 10 W.

T. 26 N. | T. 27 N.

305 000 FEET

295 000 FEET

1 210 000 FEET

(Joins sheet 14)

(Joins sheet 16)

(Joins sheet 20)

Cedar Creek

Red Creek

Maple Creek

Owl Creek

South Fork Owl Creek

HOH RIVER

1 Mile

5000 Feet

0

Scale 1:20000

1 000 0 1 000 2 000 3 000 4 000 5 000

N

1 Mile
5000 Feet
Scale 1:20000

(Joins sheet 10)

R. 10 W.

1 235 000 FEET

T. 27 N.
T. 26 N.

305 000 FEET

(Joins sheet 15)

295 000 FEET

1 215 000 FEET

(Joins sheet 21)

32 33 34 35
5 4 3 2
8 9 10 11
17 16 15 14

ITD KND PHF KGD KGF RW HW KLD KED DMF SSE

South Fork Hoh River

Owl Creek

Owl Mountain

SURVEY BOUNDARY
OLYMPIC NATIONAL PARK


1 120 000 FEET
R. 13 W.
(Joins sheet 12)
N
(Joins inset, sheet 11)
295 000 FEET
OLYMPIC NATL PARK
Oil City
PARK BOUNDARY
HOH RIVER
RESERVATION BDY
HOH INDIAN RES
PACIFIC OCEAN
OLYMPIC NATIONAL PARK
Fossil Creek
Fletcher Creek
Nolan Creek
Braden Creek
Cedar Creek
101
T. 26 N.
(Joins sheet 18)
280 000 FEET
(Joins sheet 22)
1 135 000 FEET
18
17
16
15
14
19
20
21
22
23
30
29
28
27
26
32
33
34
35
CGB
SSE
HLE
KND
KAB
QT
HKE
DMF
HH
HF
HW
RW
CW
HKD
HKC
TEB
KGD
KOC
SC
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000
¼
½
¾
1

R. 13 W. | R. 12 W.

(Joins sheet 13)

1 160 000 FEET

N

1 Mile 5000 Feet

0 0

Scale 1:20000

¼ 1000 ½ 2000 ¾ 3000 1 4000 5000

(Joins sheet 17)

290 000 FEET

T. 26 N.

(Joins sheet 19)

280 000 FEET

1 140 000 FEET

(Joins sheet 23)

HOH RIVER

Nolan Creek

Pins Cr.

Braden Creek

Cedar Creek

13 18 17 16 15

24 19 20 21 22

25 30 29 28 27

36 31 32 33 34

HW RW KAB KND CGB HKC HKE HMC HLE SSE KOC KGD SPD DMF TEB 101

N

1 Mile
5000 Feet

Scale 1:20000

1 165 000 FEET

R. 12 W. | R. 11 W.

(Joins sheet 14)

290 000 FEET

T. 26 N.

(Joins sheet 18)

(Joins sheet 20)

280 000 FEET

1 185 000 FEET

(Joins sheet 24)

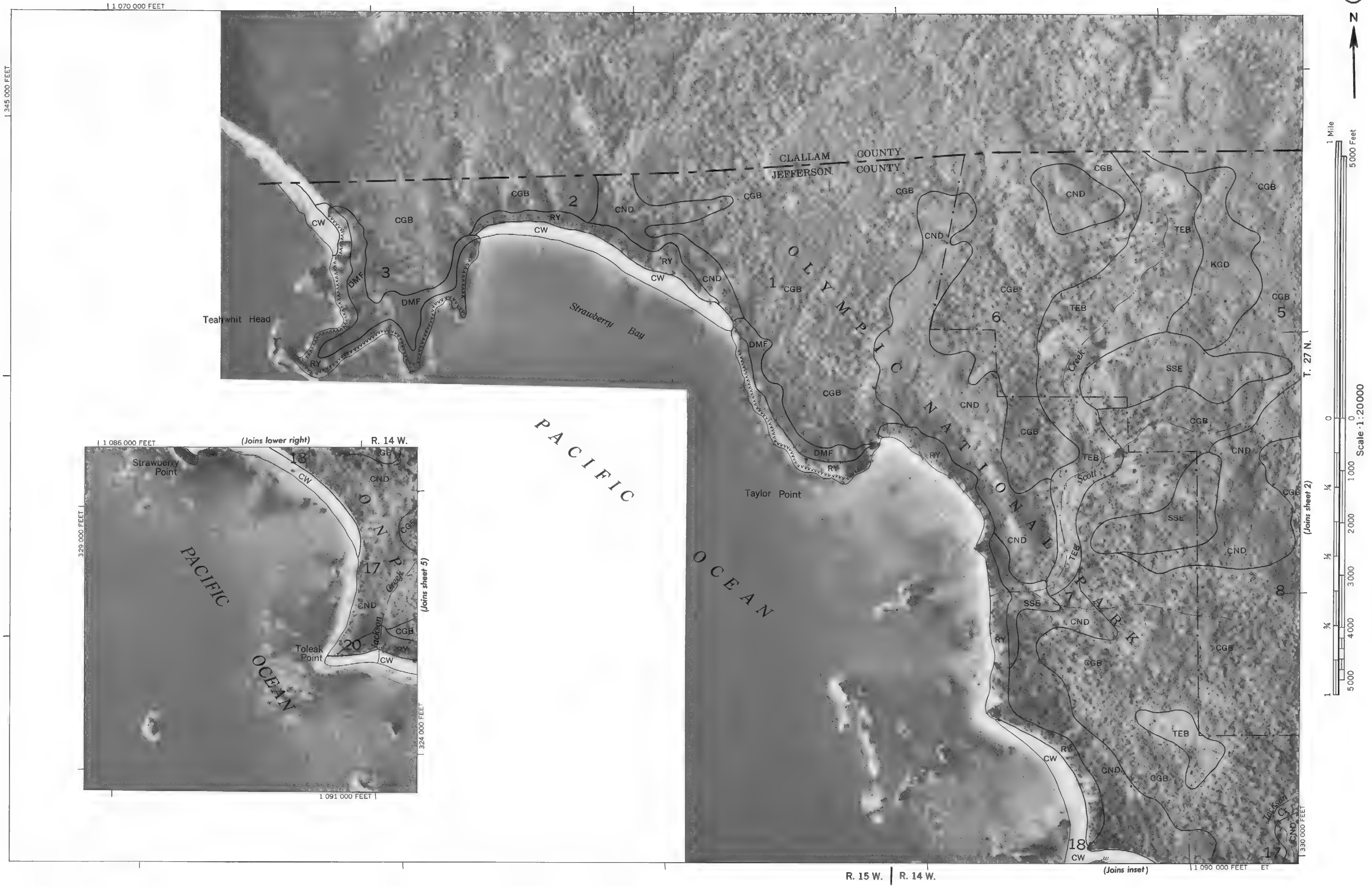
Mount Octopus

Nolan Creek

Snahopish River

15 14 13 18 17 16
22 23 24 19 20 21
27 26 25 30 29 28
34 35 36 31 32 33

CGB TEB HKC SVE DMF HLE HMC SPD SSE ITD KND KLD KAB



1
N
1 070 000 FEET
345 000 FEET
CLALLAM COUNTY
JEFFERSON COUNTY
OLYMPIC NATIONAL PARK
PACIFIC OCEAN
Teahwhit Head
Strawberry Bay
Taylor Point
Scott
Creek
CW
CGB
CND
RY
DMF
TEB
KGD
SSE
SSB
T. 27 N.
(Joins sheet 2)
(Joins inset)
R. 15 W.
R. 14 W.
1 090 000 FEET
330 000 FEET
1 Mile
5000 Feet
Scale 1:20000
1 086 000 FEET
(Joins lower right)
Strawberry Point
329 000 FEET
ONP
(Joins sheet 5)
Toleak Point
Jackson
324 000 FEET
1 091 000 FEET

JEFFERSON COUNTY AREA, WASHINGTON — SHEET NUMBER 20

20

N

1 Mile 5000 Feet

0 0

Scale 1:20000

1 1000 2000 3000 4000 5000

(Joins sheet 15)

R. 11 W. | R. 10 W.

1 210 000 FEET

290 000 FEET

T. 26 N.

(Joins sheet 21)

(Joins sheet 19)

280 000 FEET

1 190 000 FEET

(Joins sheet 25)

16 15 14 13 18

21 22 23 24 19

28 27 26 25 30

33 34 35 36 31

Dry Creek

Kunamakst Creek

River

Clearwater

Tesnoos

CGB HLB HLE HKC TEB KND SSE DMF

JEFFERSON COUNTY AREA, WASHINGTON — SHEET NUMBER 21

21

N

1 215 000 FEET

R. 10 W.

(Joins sheet 16)

290 000 FEET

T. 26 N.

(Joins sheet 20)

(Joins inset B, sheet 31)

280 000 FEET

1 235 000 FEET

(Joins sheet 26)

OLYMPIC NATIONAL PARK BDY

SOIL SURVEY LIMITS

Clearwater River

17 16 15 14

20 21 22 23 24

29 28 27 26 25

32 33 34 35 36

SSE

DMF

1 Mile

5000 Feet

Scale 1:20000

N

1 Mile 5000 Feet

Scale 1:20000

(Joins sheet 17)

R. 13 W.

1 135 000 FEET

T. 25 N. | T. 26 N.

275 000 FEET

265 000 FEET

1 115 000 FEET

(Joins sheet 23)

(Joins sheet 27)

Ruby Beach

PACIFIC OCEAN

OLYMPIC NATIONAL PARK

Cedar Creek

South Fork Cedar Creek

Sand Creek

Steamboat Creek

101

CW

SPD

KGD

32 33 34 35

5 4 3 2

8 9 10 11

17 16 15 14

KND CGB CVB SC TEB HKC HMC ITD CND SSE DMF HLE

JEFFERSON COUNTY AREA, WASHINGTON — SHEET NUMBER 23

1 140 000 FEET

R. 13 W. | R. 12 W.

(Joins sheet 18)

T. 25 N. | T. 26 N.

275 000 FEET

36 31 32 33 34

1 6 5 4 3

12 7 8 9 10

13 18 17 16 15

KND TEB HKC KGD SPD HLE SSE DMF HMC ITD

Cedar Creek

S. Fork Cedar Creek

Miller Creek

East Fork Miller Creek

Kaldoch Creek

(Joins sheet 24)

(Joins sheet 22)

(Joins sheet 28)

265 000 FEET

1 160 000 FEET

23

N

1 Mile

5000 Feet

Scale - 1:20000

(24)

N

1 Mile 5000 Feet

0 0

¼ ½ ¾ 1

1000 2000 3000 4000 5000

Scale 1:20000

(Joins sheet 19)

R. 12 W. | R. 11 W.

1 185 000 FEET

T. 25 N. | T. 26 N.

275 000 FEET

265 000 FEET

(Joins sheet 23)

(Joins sheet 25)

1 165 000 FEET

(Joins sheet 29)

34 35 36 31 32 33

3 2 1 6 5 4

10 11 12 7 8 9

15 14 13 18 17 16

DMF SSE SPD ITD TEB KLD KND KAB HKC CGB HKD HKE HLE HKC

CLEARWATER HONOR CAMP

Snahopish River

Christmas Creek

Pearson Creek

Bull Creek

JEFFERSON COUNTY AREA, WASHINGTON — SHEET NUMBER 25

25

N

1 190 000 FEET

(Joins sheet 20)

R. 11 W. | R. 10 W.

T. 26 N. | 275 000 FEET

T. 25 N.

(Joins sheet 24)

(Joins sheet 26)

Sections: 33, 34, 35, 36, 31, 4, 3, 2, 1, 6, 9, 10, 11, 12, 7, 16, 15, 14, 13, 18

Soil codes: KND, HLE, DMF, KLD, SSE, TEB, HKC, ITF, SPD, CBB

Hydrography: Clearwater River, Clearwater, Itswoot Creek, Solleks River, Solleks, Stequaleho Creek, Stequaleho

1 Mile
5000 Feet
Scale 1:20000
0 0 ¼ ½ ¾ 1
1000 2000 3000 4000 5000

260 000 FEET

1 210 000 FEET

(Joins sheet 30)

N

1 Mile 5000 Feet

0 1 Scale 1:20000

(Joins sheet 21)

R. 10 W.

1 235 000 FEET

T. 25 N. | T. 26 N.

275 000 FEET

(Joins inset A, sheet 31)

(Joins sheet 25)

260 000 FEET

1 215 000 FEET

(Joins sheet 31)

32 33 34 35 36

5 4 3 2 1

8 9 10 11

17 16 15 14

DMF SSE

Solleks River

Yahoo Lake

Stequaleho Creek

BOUNDARY

PARK

SURVEY

NATIONAL FOREST

LIMIT OF OLYMPIC

1 115 000 FEET
1 260 000 FEET
R. 13 W.
(Joins sheet 22)
(Joins sheet 28)
T. 25 N.
250 000 FEET
(Joins sheet 32)
1 135 000 FEET
N
1 Mile
5000 Feet
Scale 1:20000
OLYMPIC NATIONAL PARK
PACIFIC OCEAN
Kalaloch Creek
West Fork Kalaloch Creek
East Fork Kalaloch Creek
16
15
14
21
22
23
28
27
26
33
34
35
101
TEB
HLE
SSE
DMF
CND
HKC
CGB
SPD
CW
KND
QT
SC


N
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000
¼
½
¾
1
R. 13 W. | R. 12 W.
(Joins sheet 23)
1 160 000 FEET
250 000 FEET
T. 25 N.
(Joins sheet 29)
(Joins sheet 27)
(Joins sheet 33)
1 140 000 FEET
13
18
17
16
15
24
19
20
21
22
25
30
29
28
27
36
31
32
33
34
Kalaloch
Creek
East
Fork
Mink
Miller
Cougar
CLEARWATER
RIVER
Shale
Elkhorn
SSE
DMF
SPD
HLE
HF
CGB
HKC
QT
KGD
KND
KGF
KGP
TEB
ITD


29
R. 12 W.
R. 11 W.
1 165 000 FEET
260 000 FEET
245 000 FEET
1 185 000 FEET
T. 25 N.
(Joins sheet 24)
(Joins sheet 28)
(Joins sheet 30)
(Joins sheet 34)
N
Scale 1:20000
1 Mile
5000 Feet
CLEARWATER
RIVER
Peterson
Creek
Christmas
Bull
Snahapish
River
North
Fork
Manor
South
Fork
Deception
Prairie
Shale
DMF
HLE
SPD
SSE
CGB
HKD
HKC
KLF
KLD
QT
HW
HF
ITD
KGF
KND
TEB

(2)

N

1 Mile 5000 Feet

0 0

Scale 1:20000

1 5000 4000 3000 2000 1000 0

1 115 000 FEET

345 000 FEET

CLALLAM COUNTY

JEFFERSON COUNTY

(Joins sheet 1)

TEB CGB CND HLE SPD SSE SVE

South Fork Maxfield Creek

Murphy Creek

Falls Creek

Jackson Creek

OLYMPIC NATL QND PARK

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

T. 27 N.

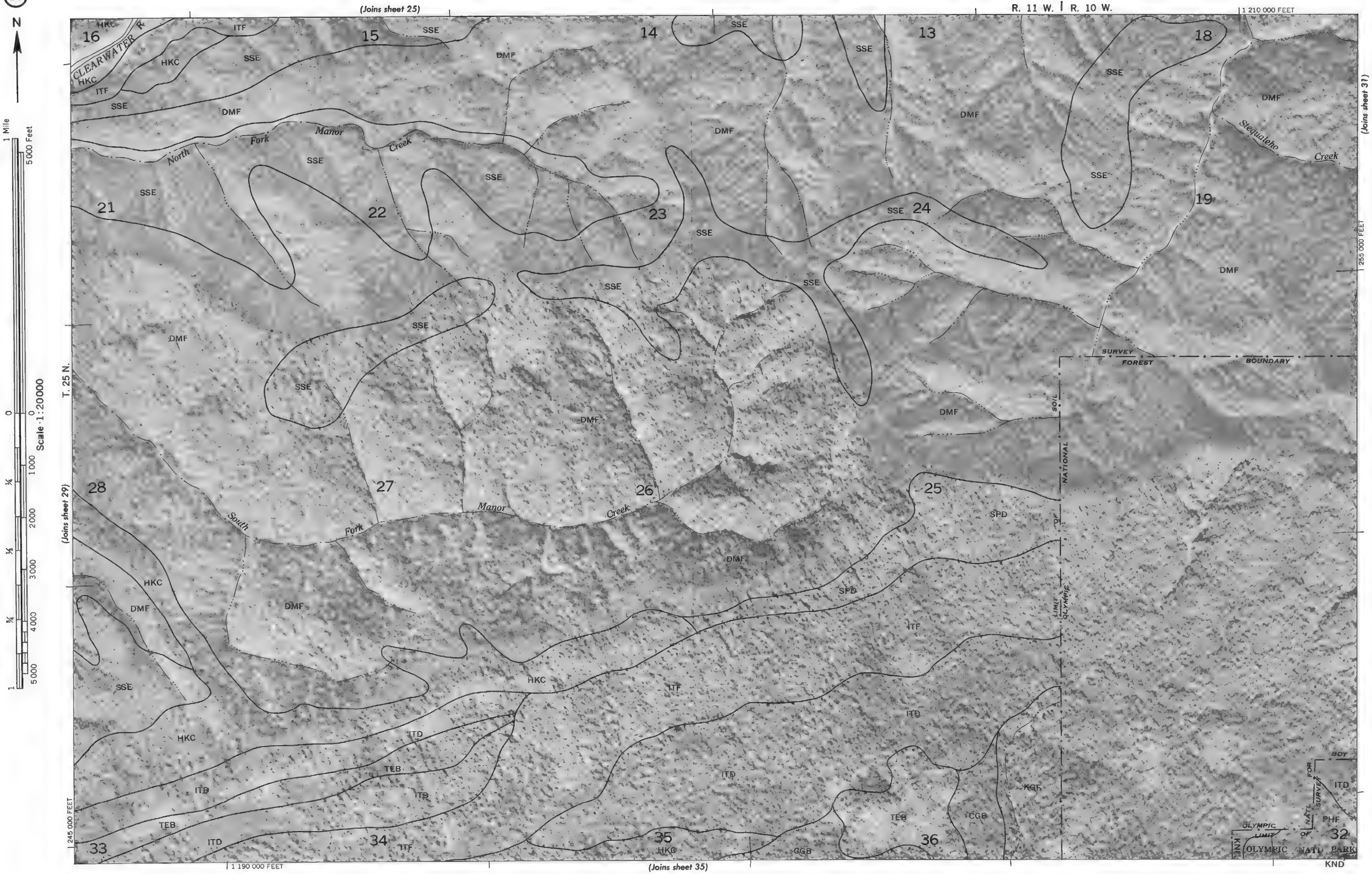
330 000 FEET

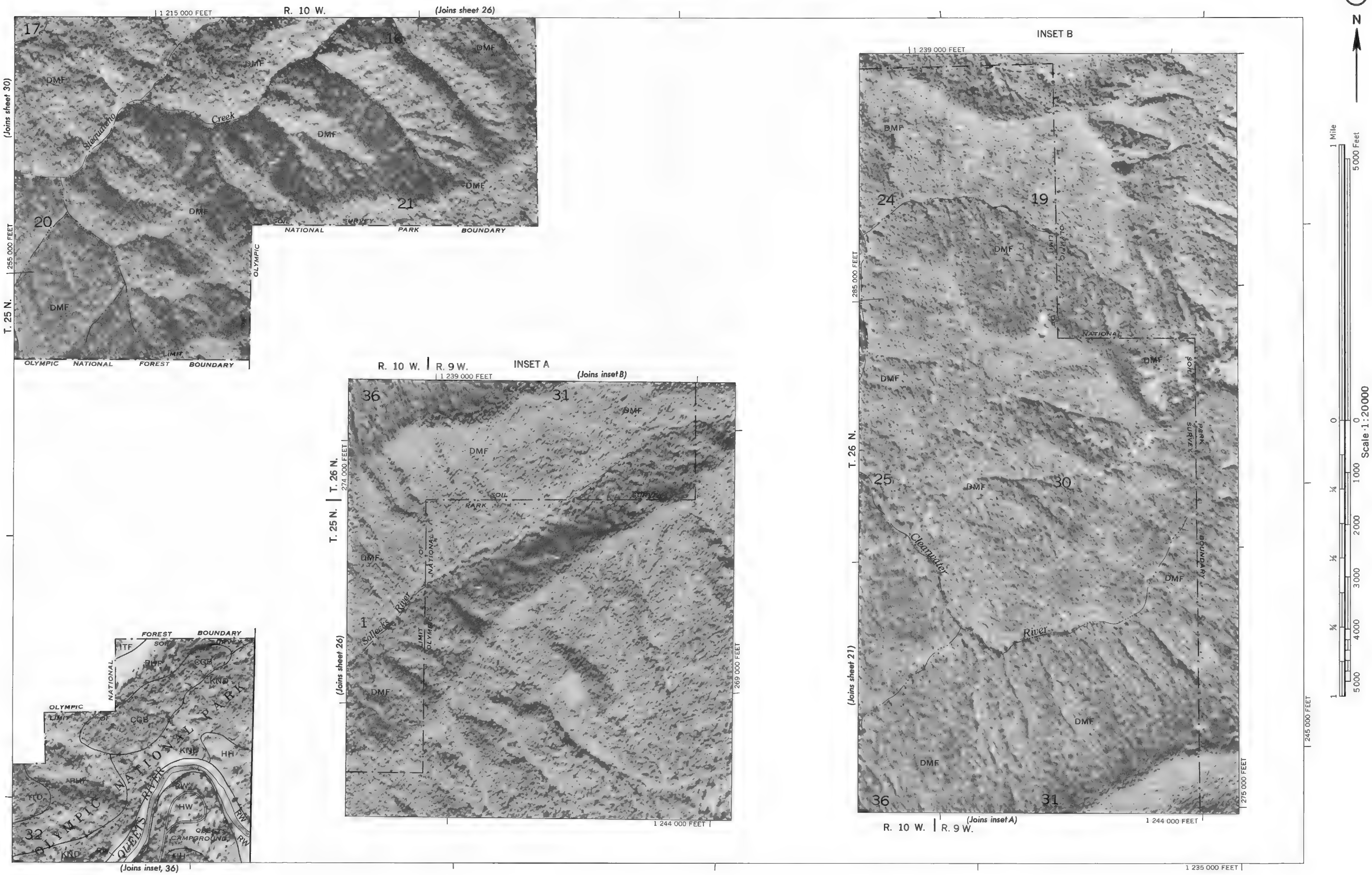
1 095 000 FEET

(Joins sheet 5)

(Joins sheet 3)

R. 14 W. R. 13 W.


30
N
1 Mile
5000 Feet
0
0
Scale 1:20000
1000
¼
2000
½
3000
¾
4000
1
5000
(Joins sheet 25)
R. 11 W. | R. 10 W.
1 210 000 FEET
(Joins sheet 31)
255 000 FEET
T. 25 N.
(Joins sheet 29)
245 000 FEET
1 190 000 FEET
(Joins sheet 35)
KND
CLEARWATER R
North Fork Manor Creek
Stequaleho Creek
South Fork Manor Creek
SURVEY FOREST BOUNDARY
SOIL NATIONAL LIMIT OF OLYMPIC
LIMIT OF SURVEY FOR NATL FOR BDY
OLYMPIC LIMIT
OLYMPIC NATL PARK
16
15
14
13
18
21
22
23
24
19
28
27
26
25
33
34
35
36
32
HKC
ITF
SSE
DMF
SPD
ITD
TEB
KGF
CGB
PHF
KNC


N
1 215 000 FEET
R. 10 W.
(Joins sheet 26)
(Joins sheet 30)
T. 25 N.
255 000 FEET
17
16
20
21
DMF
Sieguarcho Creek
SOIL SURVEY
NATIONAL PARK BOUNDARY
OLYMPIC
LIMIT
OLYMPIC NATIONAL FOREST BOUNDARY
INSET A
R. 10 W. | R. 9 W.
1 239 000 FEET
(Joins inset B)
T. 26 N. | T. 25 N.
274 000 FEET
36
31
1
Solleks River
(Joins sheet 26)
269 000 FEET
1 244 000 FEET
INSET B
1 239 000 FEET
285 000 FEET
T. 26 N.
24
19
25
30
36
31
Clearwater River
(Joins sheet 21)
(Joins inset A)
R. 10 W. | R. 9 W.
1 244 000 FEET
275 000 FEET
245 000 FEET
1 235 000 FEET
FOREST BOUNDARY
OLYMPIC NATIONAL PARK
QUEETS RIVER
QUEETS CAMPGROUND
32
CGB
KND
HH
HW
RW
(Joins inset, 36)
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000

JEFFERSON COUNTY AREA, WASHINGTON — SHEET NUMBER 32

32

N

1 Mile 5000 Feet

Scale 1:20000

(Joins sheet 27)

R. 13 W.

1 135 000 FEET

T. 24 N. | T. 25 N.

245 000 FEET

235 000 FEET

1 115 000 FEET

(Joins sheet 33)

(Joins sheet 36)

PACIFIC OCEAN

OLYMPIC NATIONAL PARK

Kalaloch

Kalaloch Creek

East Fork Kalaloch Creek

101

CW

CGB

SC

QT

TEB

CND

SPD

KND

HKD

SSE

33 34 35 4 3 2 9 10 11 16 15 14

1 140 000 FEET

R. 13 W. | R. 12 W.

T. 25 N. | T. 24 N.

245 000 FEET

(Joins sheet 28)

(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 37)

1 160 000 FEET

230 000 FEET

33

N

1 Mile

5000 Feet

Scale 1:20000

Wildcat Creek

Hurst Creek

Boulder Creek

CLEARWATER RIVER

Clearwater

N

R. 12 W. | R. 11 W.

T. 24 N. | T. 25 N.

1 185 000 FEET

240 000 FEET

230 000 FEET

1 165 000 FEET

1 Mile 5000 Feet

Scale 1:20000

(Joins sheet 29)

(Joins sheet 33)

(Joins sheet 35)

(Joins sheet 38)

Shale Creek

Hurst Creek

Boulder Creek

McKinnon Creek

Tacoma Creek

OLYMPIC NATIONAL PARK

JEFFERSON COUNTY AREA, WASHINGTON — SHEET NUMBER 35

35

N

R. 11 W. | R. 10 W.

T. 24 N. | T. 25 N.

1 190 000 FEET

240 000 FEET

(Joins sheet 30)

(Joins inset, sheet 36)

(Joins sheet 34)

(Joins sheet 39)

230 000 FEET

1 210 000 FEET

R. 10½ W.

Scale 1:20000

1 Mile 0 5000 Feet

1 000 0 1000

½ 2000

½ 3000

½ 4000

1 5000

QUEETS CORRIDOR

QUEETS

Phelan Creek

RIVER

BOUNDARY OF OLYMPIC NATIONAL FOREST

SOIL SURV.

NATL FOREST

SOIL

LIMIT OF SURVEY

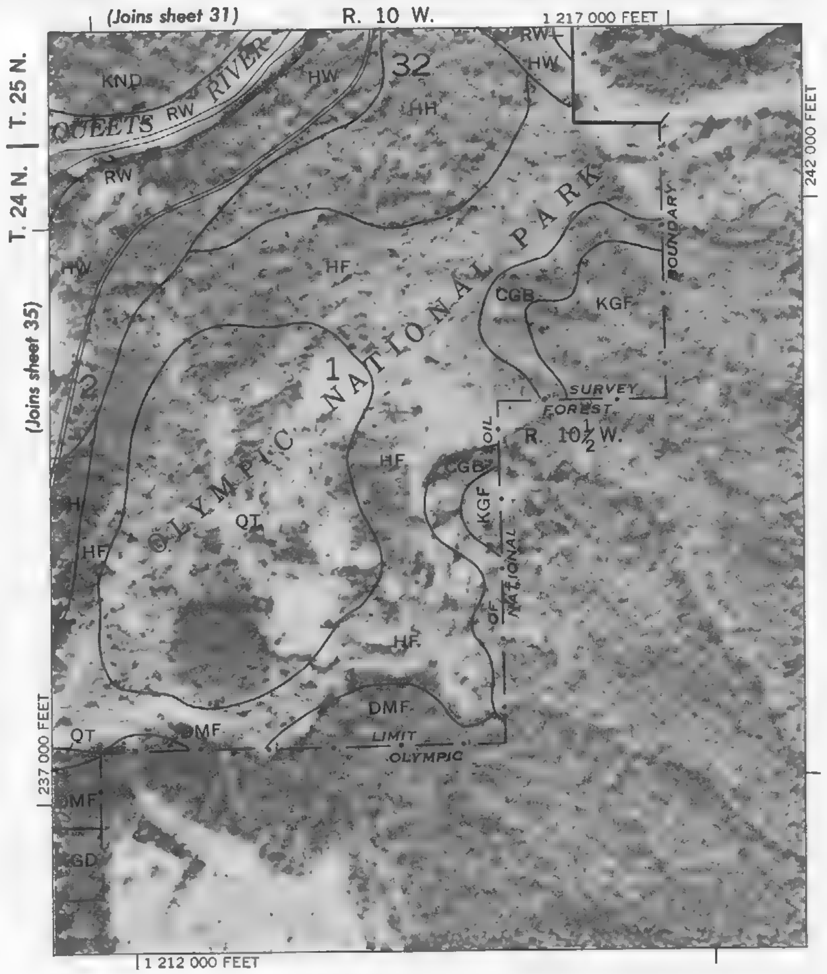
OLYMPIC

N

Scale 1:20000

1 Mile | 5 000 Feet

0 | 1000 | 2000 | 3000 | 4000 | 5 000



220 000 FEET

1 115 000 FEET

JEFFERSON COUNTY AREA, WASHINGTON — SHEET NUMBER 37

37

N

R. 13 W. | R. 12 W.

1 140 000 FEET

230 000 FEET

(Joins sheet 33)

(Joins sheet 36)

(Joins sheet 38)

T. 24 N.

1 160 000 FEET

215 000 FEET

1 Mile

5 000 Feet

Scale 1:20000

SPD SSE DMF SVE HKD ITD HF QT HKC PHF KND CGB KGD RHF KAB HW RW

Hurst Creek

Boulder Creek

Kert Creek

CLEARWATER

HF RIVER

QUEETS RIVER

SURVEY LINE

INDIAN RESERVATION

BOUNDARY

OLYMPIC NATIONAL PARK

23 24 25 26 19 20 21 22 29 28 27 30 34 38


N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 34)
(Joins sheet 37)
(Joins sheet 39)
R. 12 W. | R. 11 W.
T. 24 N.
1 185 000 FEET
225 000 FEET
215 000 FEET
1 165 000 FEET
McKinnon Creek
Tacoma Creek
Mud Creek
Salmon River
QUEETS RIVER
OLYMPIC NATIONAL PARK
QUINAULT INDIAN RESERVATION LIMIT OF SOIL SURVEY BOUNDARY
JEFFERSON COUNTY
GRAYS HARBOR COUNTY
22
23
24
19
20
27
26
25
30
29
34
35
36
31
32
HKC
KGD
KLF
TEB
QT
HH
HW
RW
PHF
KND
HKE
HNB
KAB
HF
HKC

N

1 190 000 FEET

R. 11 W.

(Joins sheet 35)

1 225 000 FEET

T. 24 N.

(Joins sheet 38)

OLYMPIC NATL PARK

QUEETS RIVER

Mud Creek

Matheny Creek

Salmon River

OLYMPIC NATIONAL FOREST BOUNDARY

SOIL SURVEY OF OLYMPIC NATIONAL FOREST BOUNDARY LIMIT

21 22 23 24 25 26 27 28 33 34 35 36

HH RW HW QT PHF KGD KAB CGB RHF KND HKC HNB HKE DMF SSE HKD TBE

1 Mile

5000 Feet

Scale 1:20000

215 000 FEET

1 210 000 FEET

JEFFERSON COUNTY

GRAYS HARBOR COUNTY

3

N

1 120 000 FEET

345 000 FEET

CLALLAM COUNTY
JEFFERSON COUNTY

Dry Creek
Matheia Creek
BOGACHIEL RIVER
Lagitos Hill
May Creek
Goodman Cr

101

CGB HLE SSE SPD CVB CND KGD HF RW HKE HKC SVE DMF KGF HKD HMC HNB TEB

6 5 4 3 2 7 8 9 10 11 18 17 16 15 14

T. 27 N.

R. 13 W.

(Joins sheet 2)

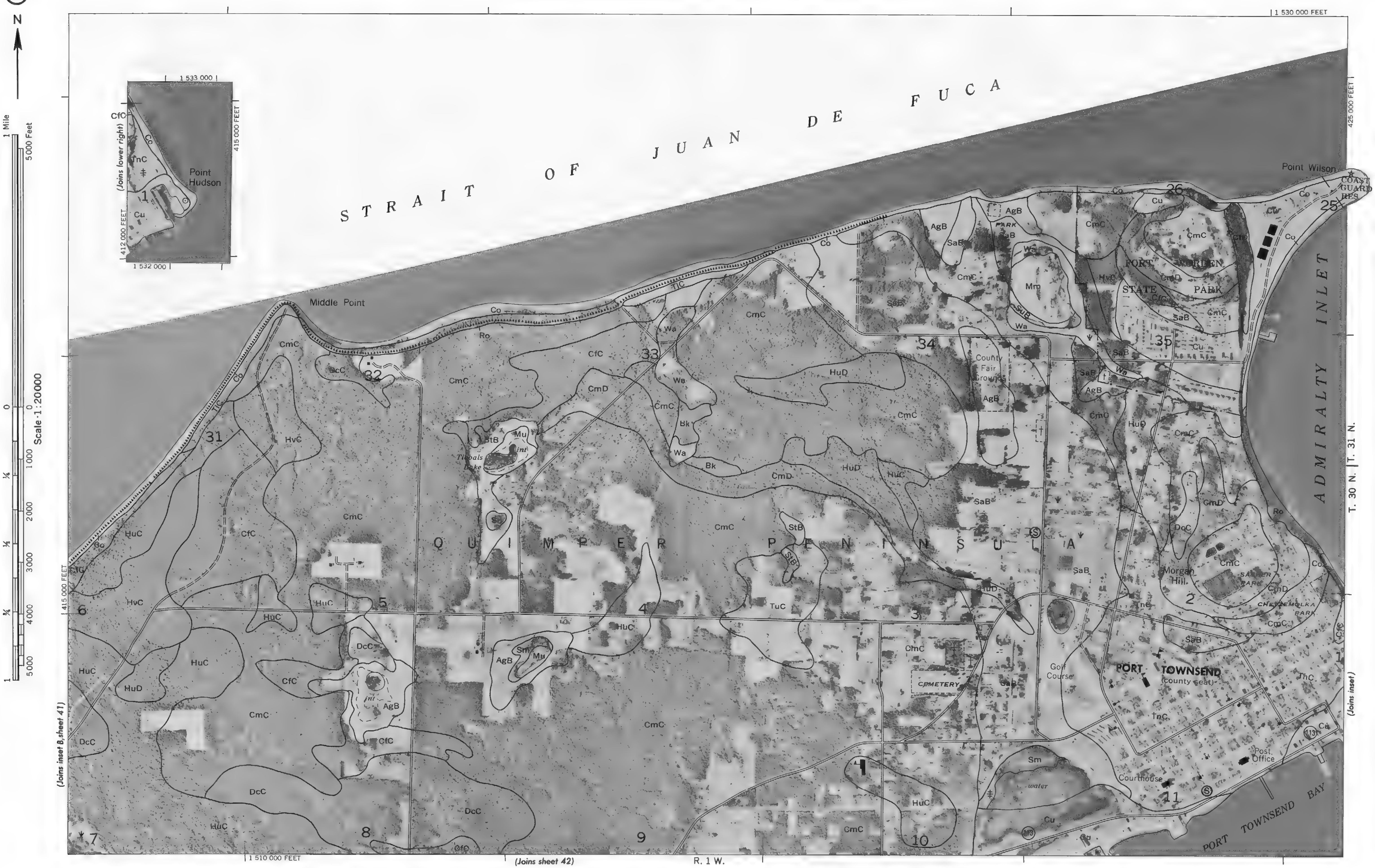
(Joins sheet 4)

(Joins sheet 6)

330 000 FEET

1 140 000 FEET

1 Mile
5000 Feet
Scale 1:20000
0 1000 2000 3000 4000 5000


N
1 Mile
5000 Feet
Scale 1:20000
1 530 000 FEET
425 000 FEET
415 000 FEET
1 510 000 FEET
(Joins sheet 42)
R. 1 W.
T. 30 N. | T. 31 N.
(Joins inset B, sheet 41)
(Joins inset)
1 533 000
1 532 000
412 000 FEET
415 000 FEET
(Joins lower right)
Point Hudson
STRAIT OF JUAN DE FUCA
ADMIRALTY INLET
PORT TOWNSEND BAY
QUIMPER PENINSULA
Middle Point
Point Wilson
COAST GUARD RES
FORT WORDEN STATE PARK
County Fair Grounds
Tibbals Lake
Morgan Hill
CHETZEMOLKA PARK
PORT TOWNSEND (county seat)
Golf Course
CEMETERY
Courthouse
Post Office
water

41

INSET A
R. 2 W.

INSET B
R. 2 W. | R. 1 W.

1 485 000 FEET
1 490 000 FEET
1 500 000 FEET
1 505 000 FEET
410 000 FEET
415 000 FEET
420 000 FEET
T. 30 N. | T. 31 N.
T. 30 N.

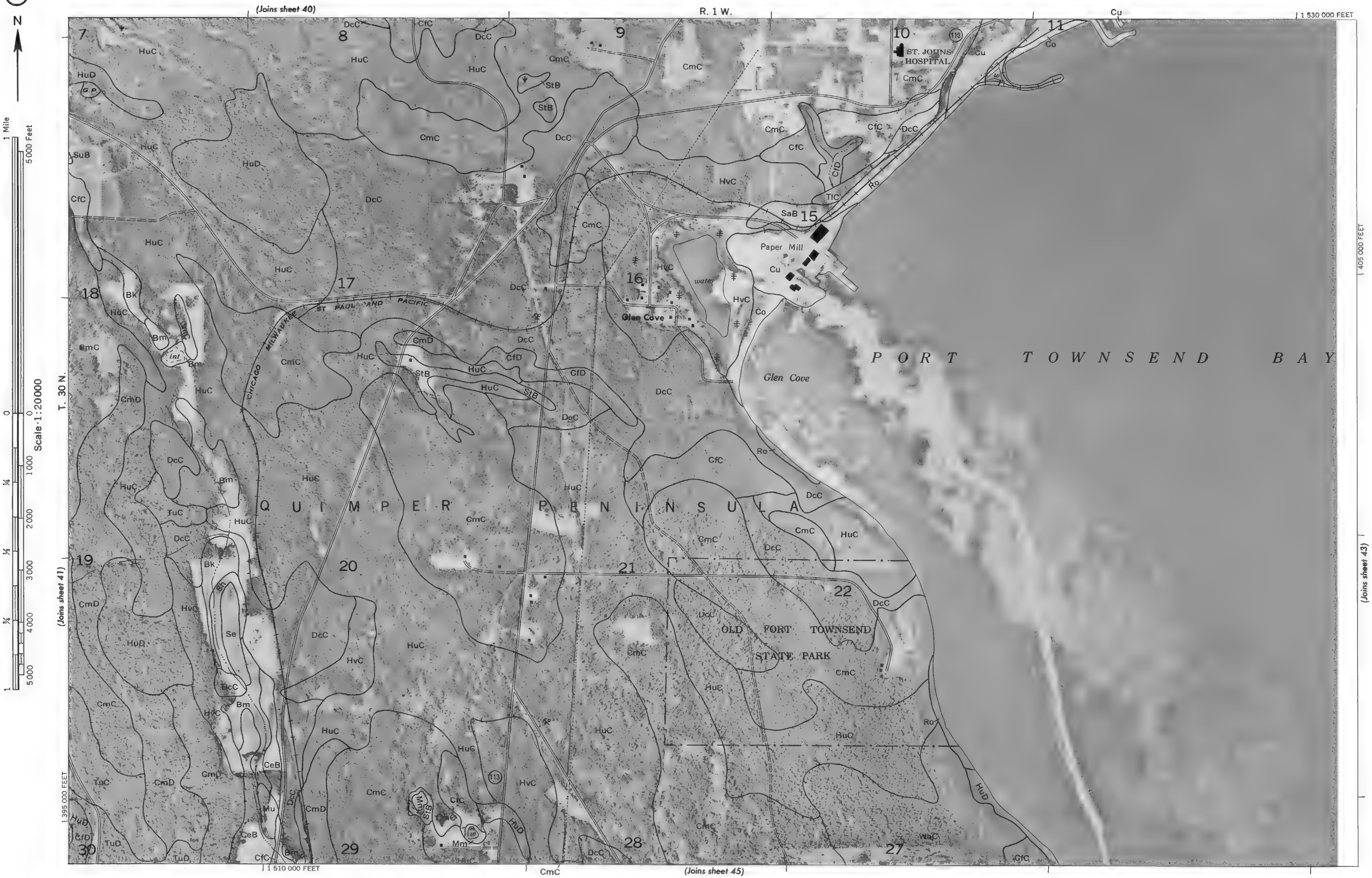
STRAIT OF JUAN DE FUCA
PORT DISCOVERY BAY
CLALLAM COUNTY
JEFFERSON COUNTY
QUIMPER PENINSULA
MILLER PENINSULA
PROTECTION ISLAND
Kanem Point
Violet Point
Cape George
Beckett Point
Dungeness
SAND DUNES
Eagle Cr.

(Joins sheet 39)
(Joins sheet 40)
(Joins sheet 41)
(Joins sheet 42)
(Joins sheet 44)

4000 AND 5000-FOOT GRID TICKS

N

1 Mile
5000 Feet
Scale 1:20000


(Joins sheet 40)
R. 1 W.
Cu
1 530 000 FEET
N
1 Mile
5000 Feet
Scale 1:20000
T. 30 N.
(Joins sheet 41)
(Joins sheet 43)
(Joins sheet 45)
1 510 000 FEET
395 000 FEET
405 000 FEET
ST. JOHNS HOSPITAL
Paper Mill
Glen Cove
PORT TOWNSEND BAY
QUIMPER PENINSULA
OLD FORT TOWNSEND STATE PARK
CHICAGO MILWAUKEE ST PAUL AND PACIFIC
water
113

N

1 535 000 FEET

405 000 FEET

T. 30 N.

(Joins sheet 42)

PORT TOWNSEND BAY

KILISUT HARBOR

ADMIRALTY INLET

MARROWSTONE ISLAND

INDIAN ISLAND

FORT FLAGLER STATE PARK

U S NAVAL RES

COAST GUARD RES

Marrowstone Point

Walan Point

8 9 13 17 18 19 20 21 24 25 28 29 30

Co Cu TuD WhC WhD TfC DcC CfC CeB HuC Sm Sh Mm Sd Ro Wa AgB CdB TuC

R.1 W. R. 1 E.

(Joins sheet 46)

1 555 000 FEET

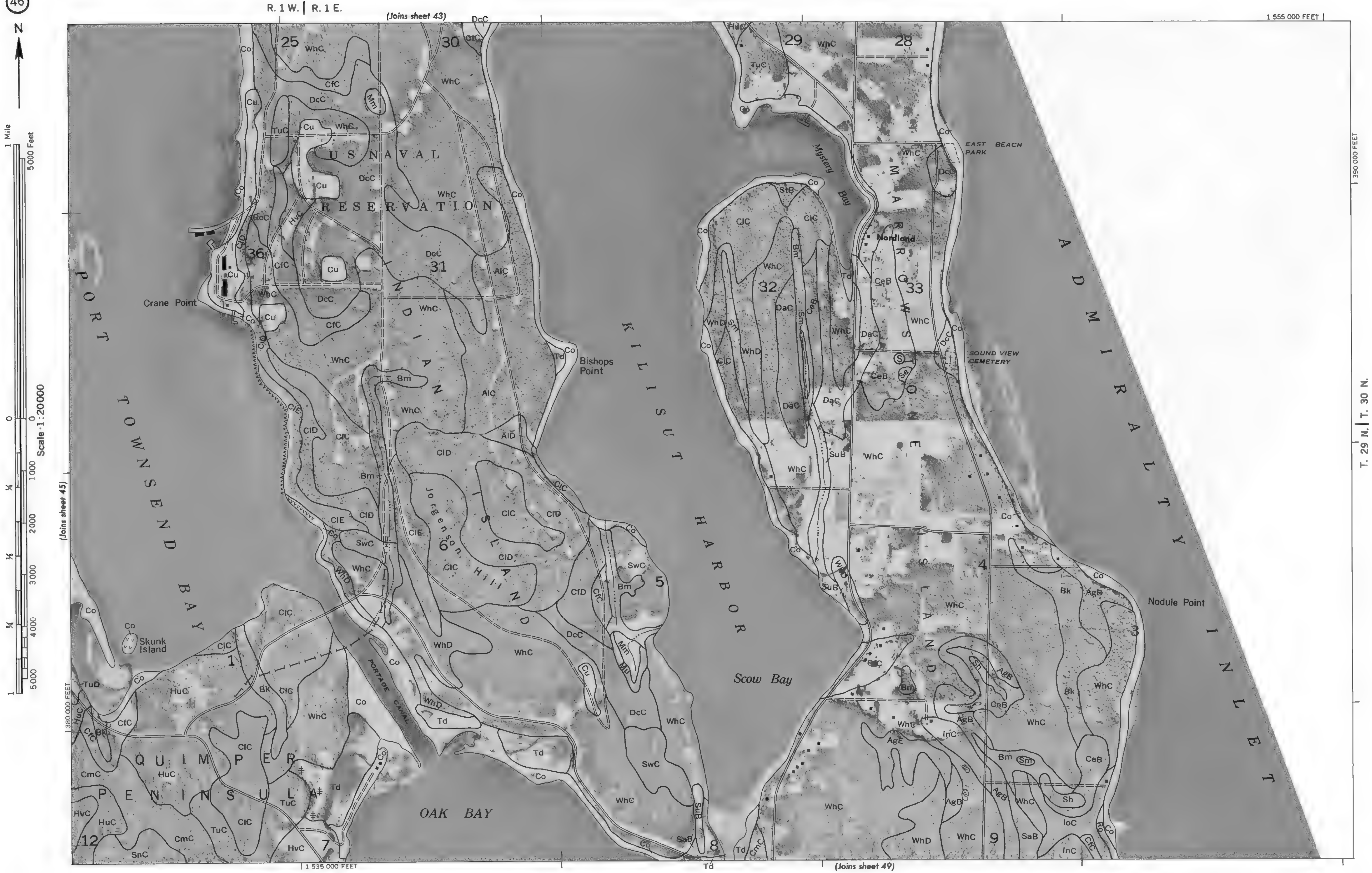
395 000 FEET

1 Mile 5000 Feet

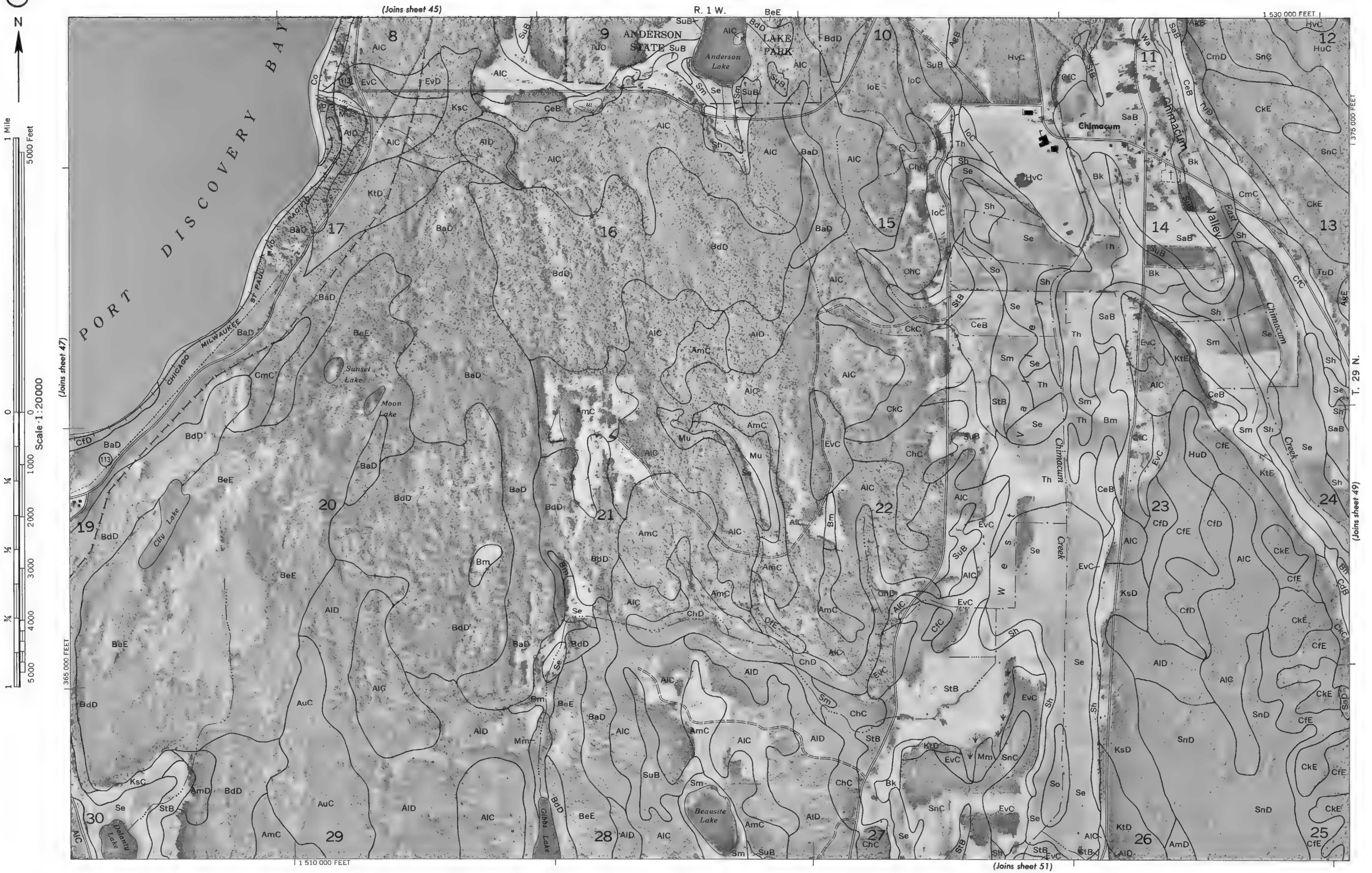
Scale 1:20000

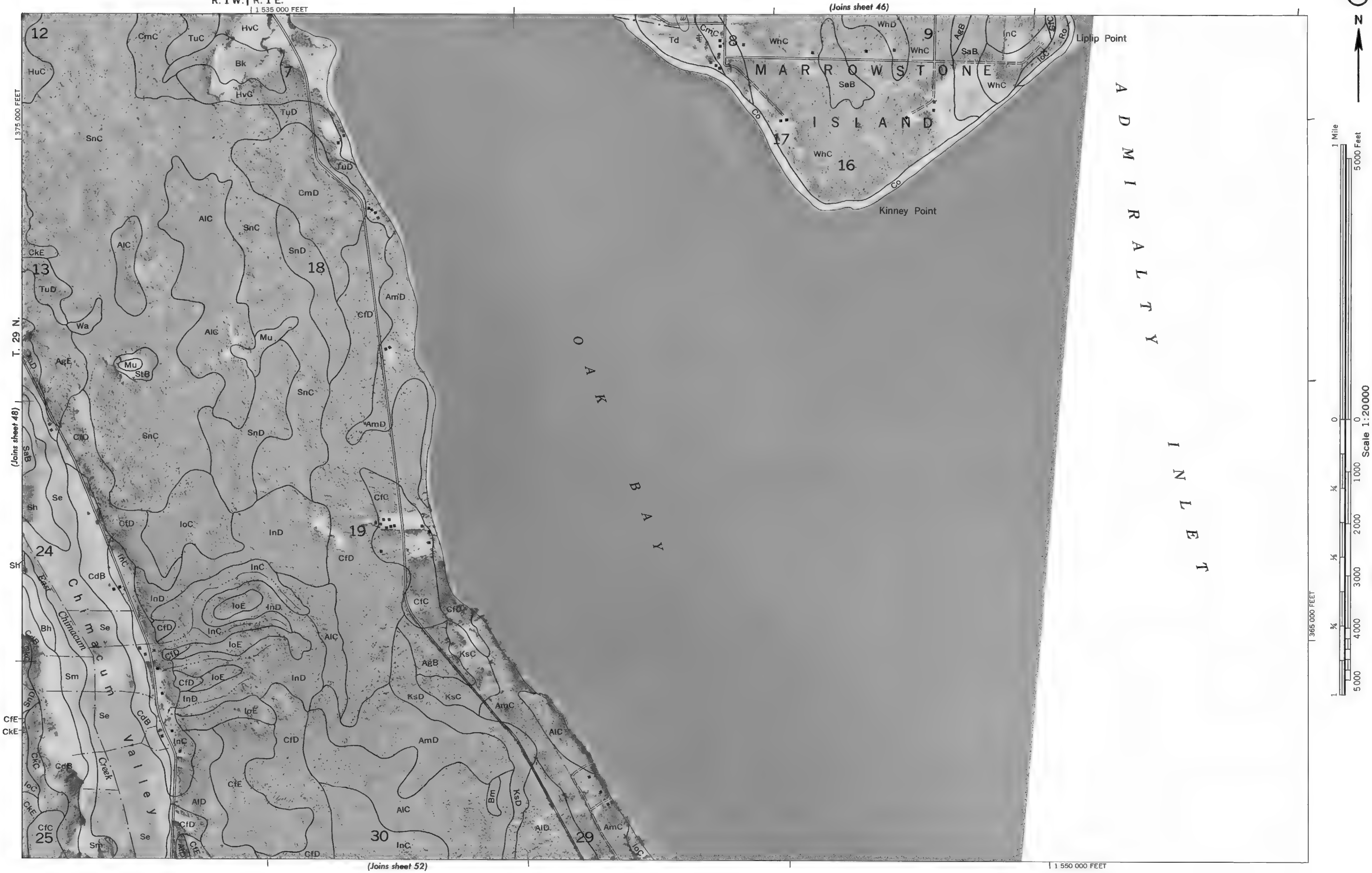

(Joins sheet 41)
(Joins sheet 45)
(Joins sheet 47)
N
Scale 1:20000
1 Mile
5000 Feet
1 505 000 FEET
1 485 000 FEET
390 000 FEET
380 000 FEET
T. 29 N. | T. 30 N.
R. 2 W.
PORT DISCOVERY BAY
MILLER PENINSULA
CLALLAM COUNTY
Contractors Point
Kalset Point
Gardner
Eagle Creek
Contractors Creek
CHICAGO MILWAUKEE ST PAUL AND PACIFIC
101


1 510 000 FEET
R. 1 W.
(Joins sheet 42)
N
PORT TOWNSEND BAY
PORT DISCOVERY BAY
QUIMPER PENINSULA
JEFFERSON COUNTY AIRPORT
CHICAGO MILWAUKEE ST PAUL AND PACIFIC
Kala Point
Tukey
Keymes Beach
Four Corners
Irondale
Hadlock
Chimacum Creek
Chimacum Valley
ANDERSON LAKE STATE PARK
Anderson Lake
GRAVEL PIT
390 000 FEET
380 000 FEET
T. 30 N.
T. 29 N.
(Joins sheet 44)
(Joins sheet 46)
(Joins sheet 48)
1 530 000 FEET
1 Mile
5000 Feet
Scale 1:20000

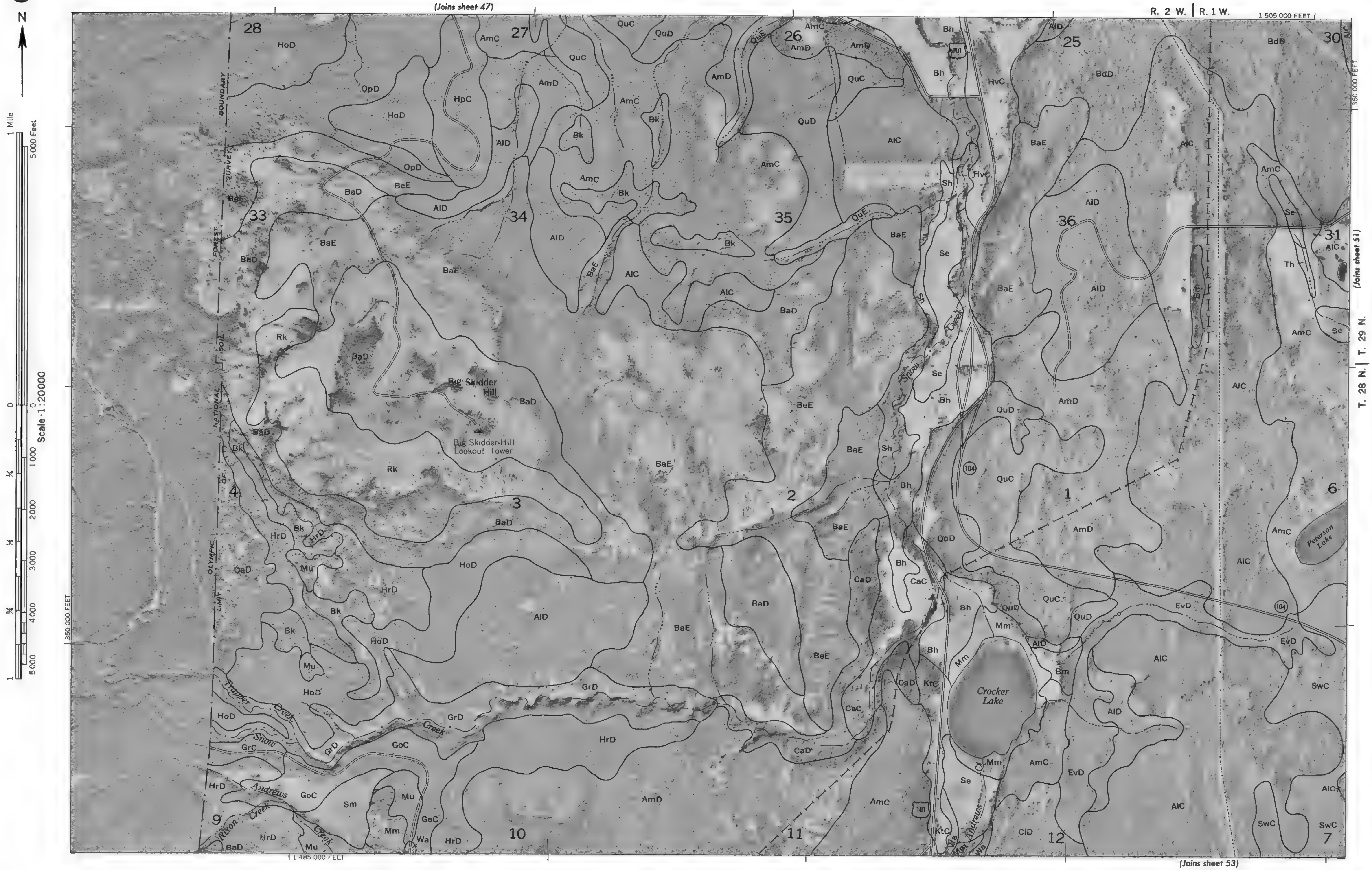

N
R. 1 W. | R. 1 E.
(Joins sheet 43)
(Joins sheet 45)
(Joins sheet 49)
1 555 000 FEET
1 535 000 FEET
390 000 FEET
380 000 FEET
T. 29 N. | T. 30 N.
1 Mile
5000 Feet
Scale 1:20000
PORT TOWNSEND BAY
Crane Point
U S NAVAL RESERVATION
INDIAN ISLAND
Jorgenson Hill
Bishops Point
KILISUT HARBOR
Scow Bay
Mystery Bay
Nordland
MARROWSTONE ISLAND
EAST BEACH PARK
SOUND VIEW CEMETERY
ADMIRALTY INLET
Nodule Point
Skunk Island
QUIMPER PENINSULA
PORTAGE CANAL
OAK BAY
25
30
29
28
36
31
32
33
6
5
4
3
1
12
7
8
9

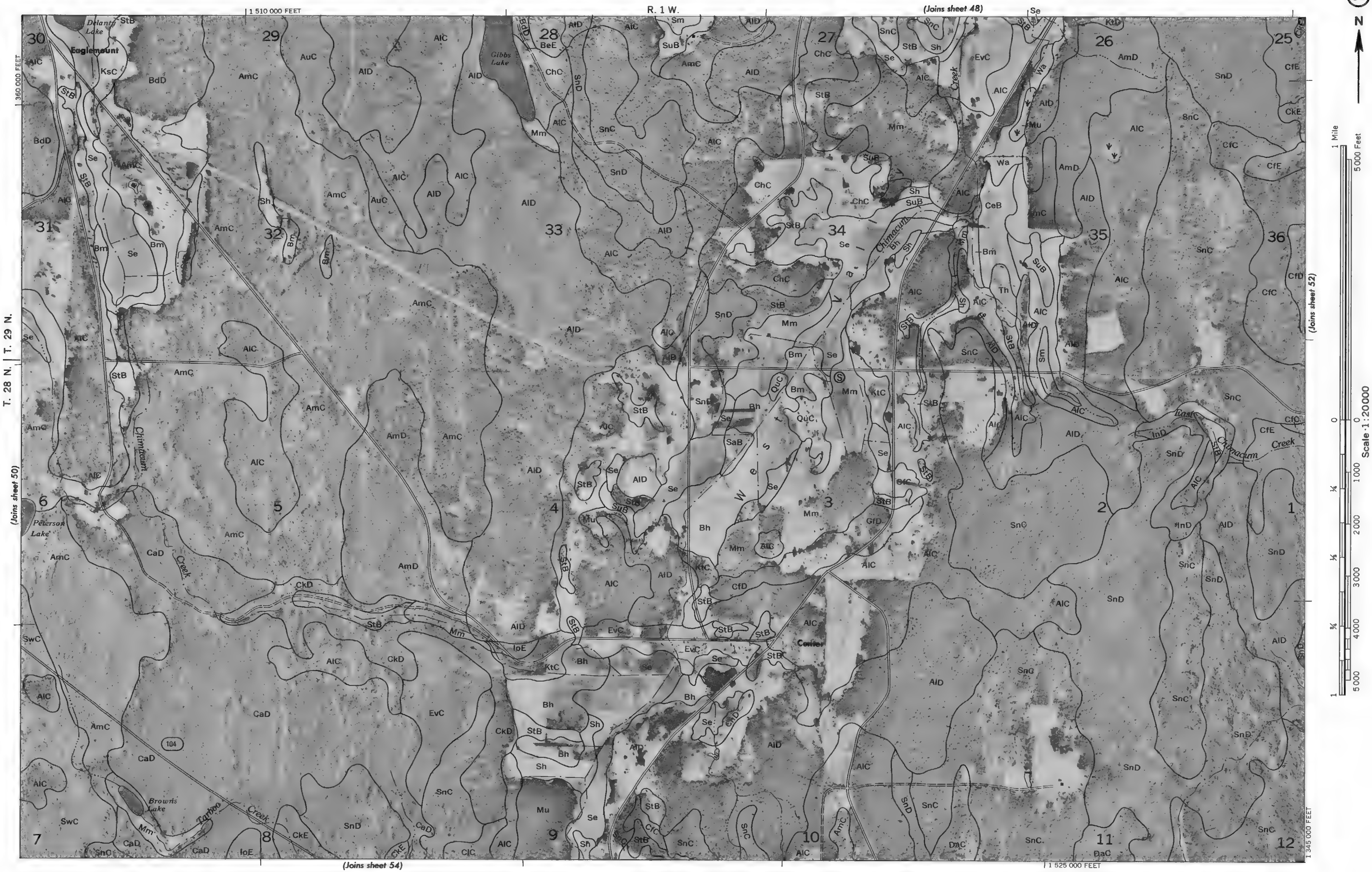

47
N
1 485 000 FEET
(Joins sheet 44)
R. 2 W. | R. 1 W.
Mill Point
Port Discovery
Maynard
PORT DISCOVERY BAY
Discovery Junction
Uncas
CHICAGO MILWAUKEE ST PAUL AND PACIFIC
GRAVEL PIT
CLALLAM COUNTY
OLYMPIC NATIONAL FOREST SOIL SURVEY BOUNDARY
North Fork
Salmon Creek
Snow Creek
T. 29 N.
(Joins sheet 48)
375 000 FEET
365 000 FEET
1 505 000 FEET
(Joins sheet 50)
Scale 1:20000
1 Mile
5000 Feet
101
113
9
10
11
12
13
14
15
16
18
19
21
22
23
24
25
26
27
28
30


N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 45)
R. 1 W.
1 530 000 FEET
1 375 000 FEET
T. 29 N.
(Joins sheet 47)
(Joins sheet 49)
(Joins sheet 51)
1 510 000 FEET
365 000 FEET
PORT DISCOVERY BAY
CHICAGO MILWAUKEE ST PAUL AND PACIFIC
ANDERSON STATE LAKE PARK
Anderson Lake
Chimacum
Chimacum Valley
East
Chimacum Creek
West Chimacum Creek
Sunset Lake
Moon Lake
City Lake
Beausite Lake
Gibbs Lake
Delanty Lake
113


49
N
R. 1 W. | R. 1 E.
1 535 000 FEET
(Joins sheet 46)
(Joins sheet 48)
(Joins sheet 52)
375 000 FEET
365 000 FEET
1 550 000 FEET
T. 29 N.
MARROWSTONE ISLAND
Liplip Point
Kinney Point
OAK BAY
ADMIRALTY INLET
Chimacum Valley
Chimacum Creek
East
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000
¼
½
¾
1
12
13
24
25
7
18
19
30
8
9
16
17
29
HvC
TuC
CmC
HuC
Bk
HvC
TuD
SnC
TuD
CmD
AlC
SnC
SnD
AlC
CkE
TuD
Wa
AlC
Mu
Mu
StB
AgE
AmD
CfD
SnC
SnC
SnD
AmD
CfD
SaB
Se
Sh
CfD
IoC
InD
CfC
CfD
CdB
InC
InC
InD
IoE
InD
CfD
InC
IoE
AlC
CfC
CfD
Bh
Se
CfD
IoE
CfD
InD
AgB
KsC
KsD
KsC
AmC
InD
Sm
Se
CdB
InC
IoE
CfD
AmD
AlC
CfE
CkE
CkC
CdB
IoC
CkE
CfE
AlD
Bm
KsD
AlC
AlD
AmC
CfC
Sm
Se
CfD
CfD
CfE
InC
IoC
Td
CmC
WhC
WhD
WhC
AgB
SaB
InC
Ro
WhC
SaB
Co
WhC
Co


1 165 000 FEET
340 000 FEET
330 000 FEET
1 145 000 FEET
R. 13 W.
R. 12 W.
T. 27 N.
CLALLAM COUNTY
JEFFERSON COUNTY
OLYMPIC NATIONAL FOREST BOUNDARY
Morganroth Creek
BOGACHIEL RIVER
Sappmill Creek
Downs Creek
Alder Creek
SURVEY BOUNDARY
PARK
OLYMPIC NATIONAL LIMIT
(Joins sheet 3)
(Joins sheet 7)
(Joins inset, sheet 10)
1 Mile
5000 Feet
Scale 1:20000
SSE
CGB
KND
HF
RW
HW
PHF
HKE
HLE
HKC
HMC
DMF
HNB
HKD
TEB
101


(Joins sheet 47)
(Joins sheet 51)
(Joins sheet 53)
R. 2 W. | R. 1 W.
T. 28 N. | T. 29 N.
1 505 000 FEET
360 000 FEET
350 000 FEET
1 485 000 FEET
N
Scale 1:20000
1 Mile
5000 Feet
OLYMPIC NATIONAL FOREST SOIL SURVEY BOUNDARY
LIMIT OF
Big Skidder Hill
Big Skidder Hill Lookout Tower
Crocker Lake
Peterson Lake
Snow Creek
Trapper Creek
Andrews Creek
Rixon Creek
Andrews Cr.
101
104


51
N
1 510 000 FEET
R. 1 W.
(Joins sheet 48)
(Joins sheet 52)
(Joins sheet 54)
(Joins sheet 50)
360 000 FEET
1 345 000 FEET
1 525 000 FEET
T. 28 N. | T. 29 N.
Delanty Lake
Eaglemount
Gibbs Lake
Peterson Lake
Browns Lake
Chimacum Creek
East Chimacum Creek
West Valley
Tarboo Creek
Center
104
30
29
28
27
26
25
31
32
33
34
35
36
6
5
4
3
2
1
7
8
9
10
11
12
1 Mile
5000 Feet
Scale 1:20000

N

R. 1 W. | R. 1 E. (Joins sheet 49)

T. 28 N. | T. 29 N. (Joins sheet 51)

1 550 000 FEET

360 000 FEET

345000 FEET

1 530 000 FEET

(Joins sheet 55)

Scale 1:20000

1 Mile 0 5000 Feet

1000 0 1000 2000 3000 4000 5000

OAK BAY

ADMIRALTY INLET

Olele Point

Klaus Rock

Basalt Point

MATS MATS QUARRY

Mats Mats Bay

Colvos Rock

Snake Rock

Mats Mats

Swansonville

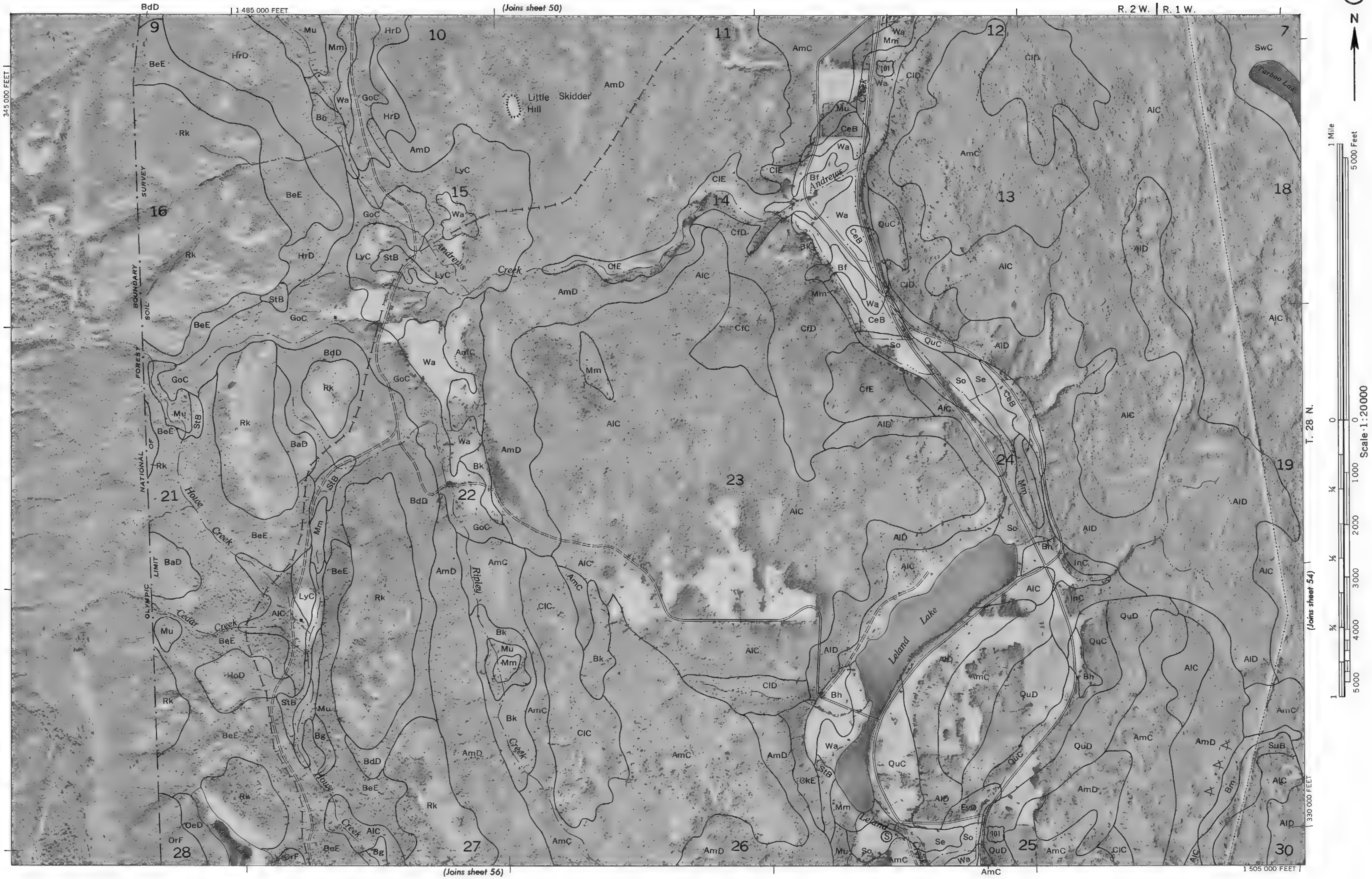
Tala Point

Chimacum Creek

East Chimacum Creek

Valley

25 30 29 28 36 31 32 33 1 6 5 4 12 7 8 9


(Joins sheet 50)
(Joins sheet 54)
(Joins sheet 56)
1 485 000 FEET
1 505 000 FEET
345 000 FEET
330 000 FEET
R. 2 W.
R. 1 W.
T. 28 N.
N
Scale 1:20 000
1 Mile
5000 Feet
OLYMPIC NATIONAL FOREST BOUNDARY
SOIL SURVEY LIMIT
Little Skidder Hill
Andrews Creek
Howe Creek
Cedar Creek
Ripley Creek
Leland Lake
Leland Creek
Tarboo Lake
101
9
10
11
12
7
13
14
15
16
18
19
21
22
23
24
25
26
27
28
30
BdD
Mu
Mm
HrD
HrD
BeE
Wa
GoC
Bb
AmD
AmC
Rk
LyC
StB
BeE
ClE
CfD
CfC
CfE
CeB
Bf
Bk
AlC
AlD
QuC
QuD
So
Se
SwC
Mm
BaD
GoC
Bk
Bh
InC
ClC
ClD
HoD
Bg
OeD
OrF
AmC
CkE
EvD
SuB
Bm


(Joins sheet 51)
R. 1 W.
1 525 000 FEET
N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 53)
T. 28 N.
340 000 FEET
(Joins sheet 55)
330 000 FEET
1 510 000 FEET
(Joins sheet 57)
Tarboo Lake
Tarboo Creek
Ludlow Lake
Horseshoe Lake
Sandy Shore Lake
Thorndyke Lake
104
7
8
9
10
11
12
18
17
16
15
14
13
19
20
21
22
23
24
30
29
28
27
26
25

1 535 000 FEET

R. 1 W. | R. 1 E.

(Joins sheet 52)

T. 28 N.

1 340 000 FEET

N

1 Mile

5000 Feet

Scale 1:20000

PORT LUDLOW

HOOD CANAL

Beaver Valley

Port Ludlow

The Twins

Creek

Horseshoe Lake

Teal Lake

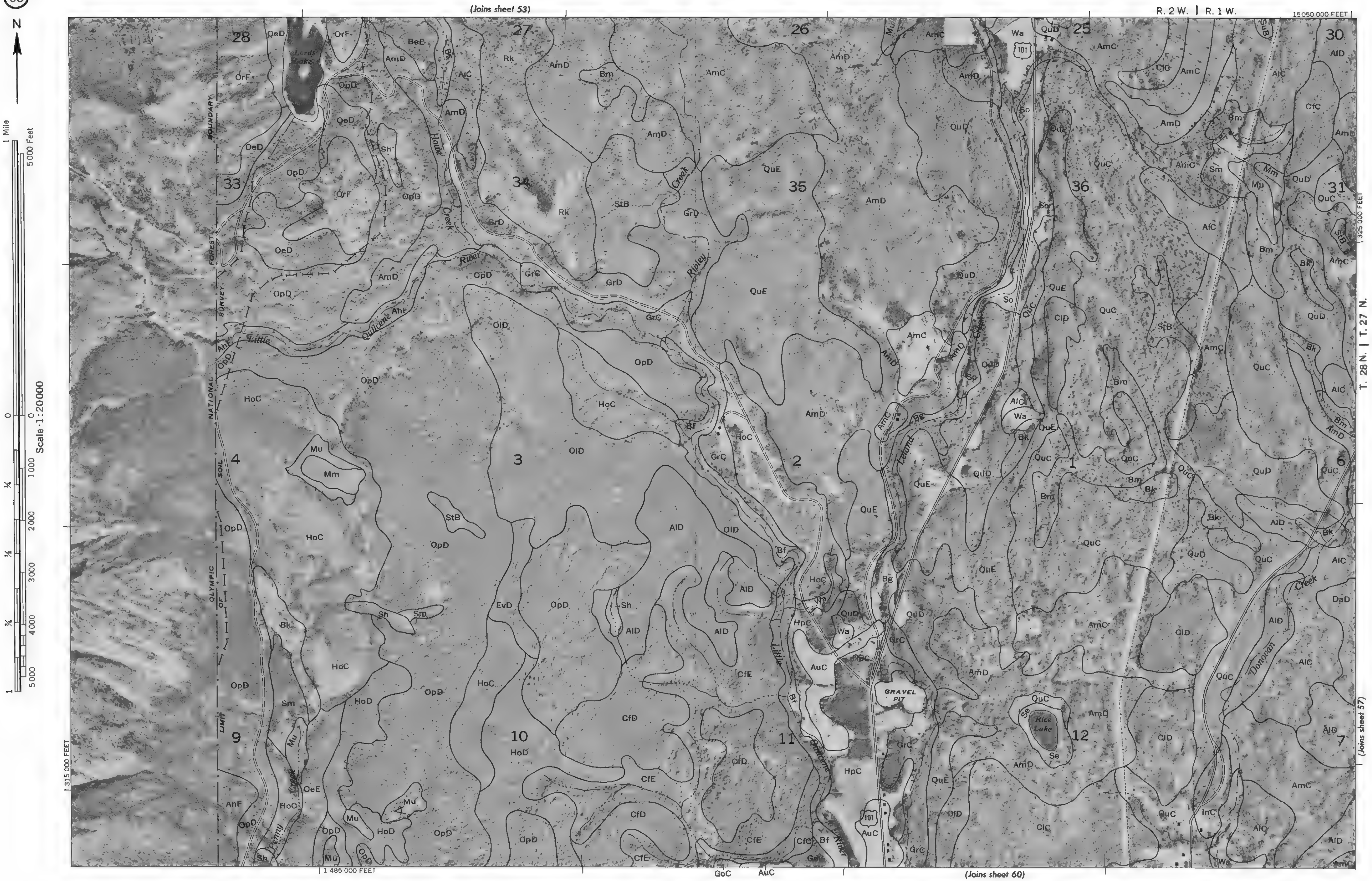
(Joins sheet 54)

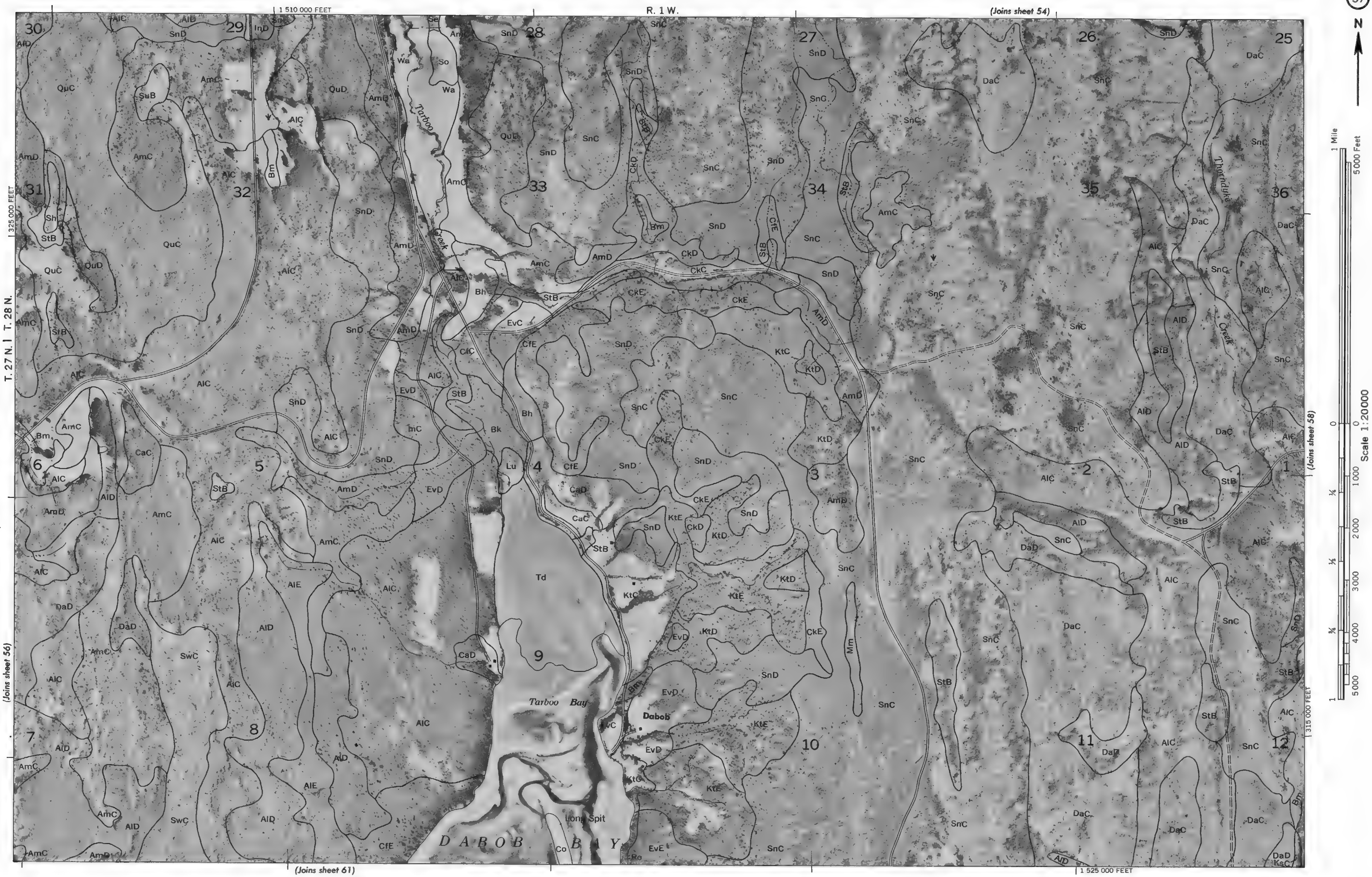
(Joins sheet 58)

(Joins inset, sheet 59)

1 550 000 FEET

330 000 FEET


(Joins sheet 53)
(Joins sheet 60)
(Joins sheet 57)
R. 2 W. | R. 1 W.
T. 28 N. | T. 27 N.
N
1 Mile
5000 Feet
Scale 1:20000
1 485 000 FEET
315 000 FEET
325 000 FEET
Lords Lake
Rice Lake
GRAVEL PIT
Quilcene River
Little Quilcene River
Howe Creek
Ripley Creek
Leland Creek
Donovan Creek
Penny Creek
OLYMPIC NATIONAL FOREST
LIMIT OF SOIL SURVEY
BOUNDARY
101


1 510 000 FEET
R. 1 W.
(Joins sheet 54)
N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 58)
(Joins sheet 56)
(Joins sheet 61)
1 525 000 FEET
325 000 FEET
315 000 FEET
T. 27 N. | T. 28 N.
Tarboo Creek
Thorndyke Creek
Tarboo Bay
Dabob
Long Spit
D A B O B   B A Y
30
29
28
27
26
25
31
32
33
34
35
36
6
5
4
3
2
1
7
8
9
10
11
12

N

R. 1 W. | R. 1 E.

(Joins sheet 55)

1 550 000 FEET

325 000 FEET

T. 27 N. | T. 28 N.

1 Mile

5000 Feet

Scale 1:20000

(Joins sheet 57)

315 000 FEET

1 530 000 FEET

(Joins sheet 62)

(Joins sheet 59)

SQUAMISH HARBOR

HOOD CANAL

Shine

Shine Creek

Wahl Lake

Thornbrake

Pheasant Lake

Mud Lake

Lost Lake

Tuath Lakes

Creek

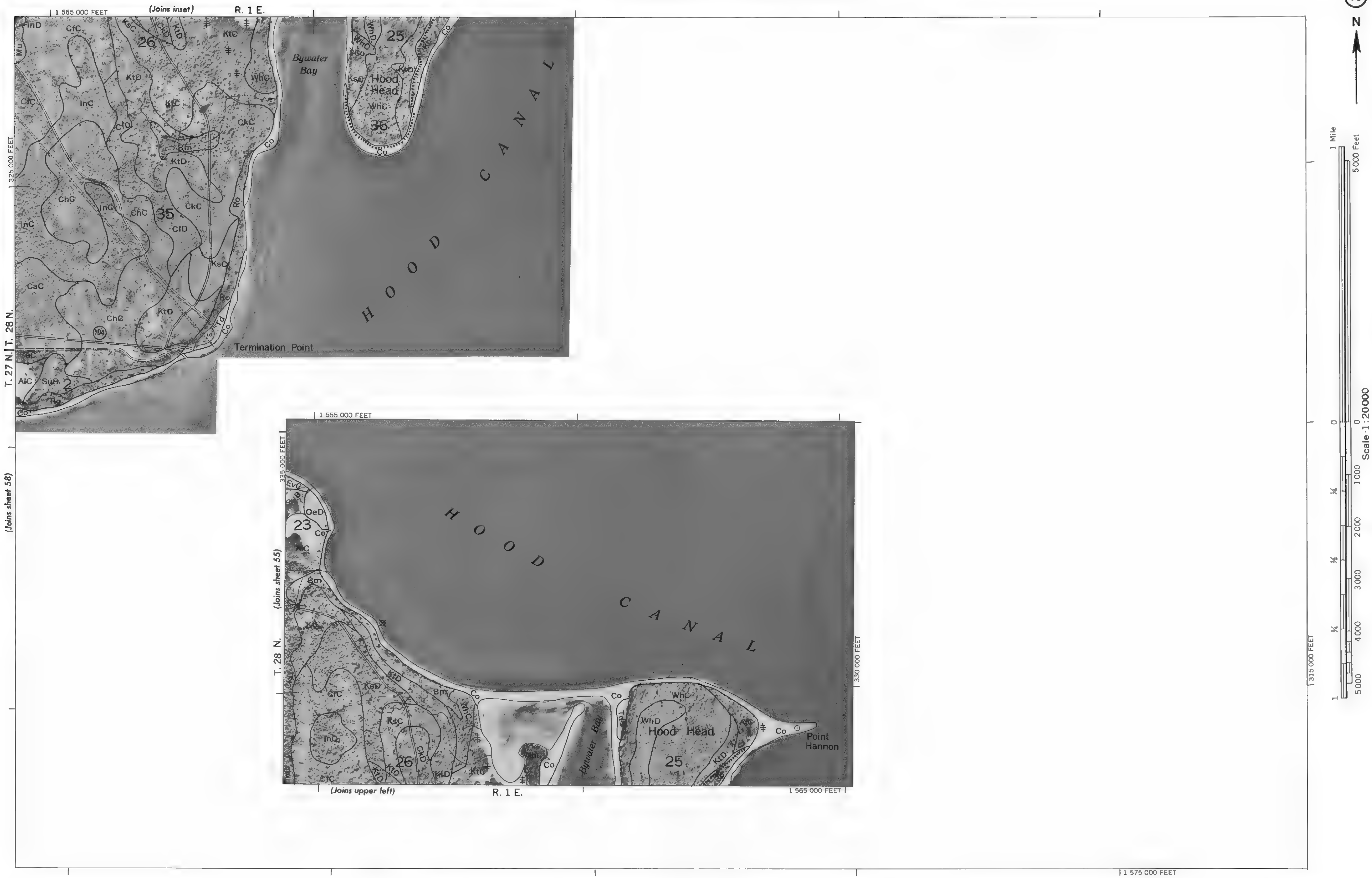
25 30 29 28 27

36 31 32 33 34

1 6 5 4 3

12 7 8 9

104


59
N
1 555 000 FEET
(Joins inset)
R. 1 E.
Bywater Bay
Hood Head
HOOD CANAL
Termination Point
T. 28 N.
T. 27 N.
325 000 FEET
(Joins sheet 58)
1 555 000 FEET
335 000 FEET
(Joins sheet 55)
Point Hannon
Bywater Bay
330 000 FEET
(Joins upper left)
1 565 000 FEET
315 000 FEET
1 575 000 FEET
1 Mile
5000 Feet
Scale 1:20000
InD
CfC
KsC
CkD
KtC
Mu
KtD
InC
Bm
ChG
ChC
CaC
CkC
CfD
Ro
Co
Td
AlC
SuB
WhC
WhD
EvC
OeD
26
25
35
36
2
23
104

JEFFERSON COUNTY AREA, WASHINGTON — SHEET NUMBER 5

5

N

1 095 000 FEET

(Joins sheet 2)

R. 14 W. | R.13 W.

(Joins inset, sheet 1)

325 000 FEET

T. 27 N.

(Joins sheet 6)

315 000 FEET

(Joins sheet 11)

1 115 000 FEET

1 Mile

5000 Feet

Scale 1:20000

OLYMPIC

PARK

CANAL

Jackson Creek

Falls Creek

Goodman Creek

Miter Creek

Mosquito Creek

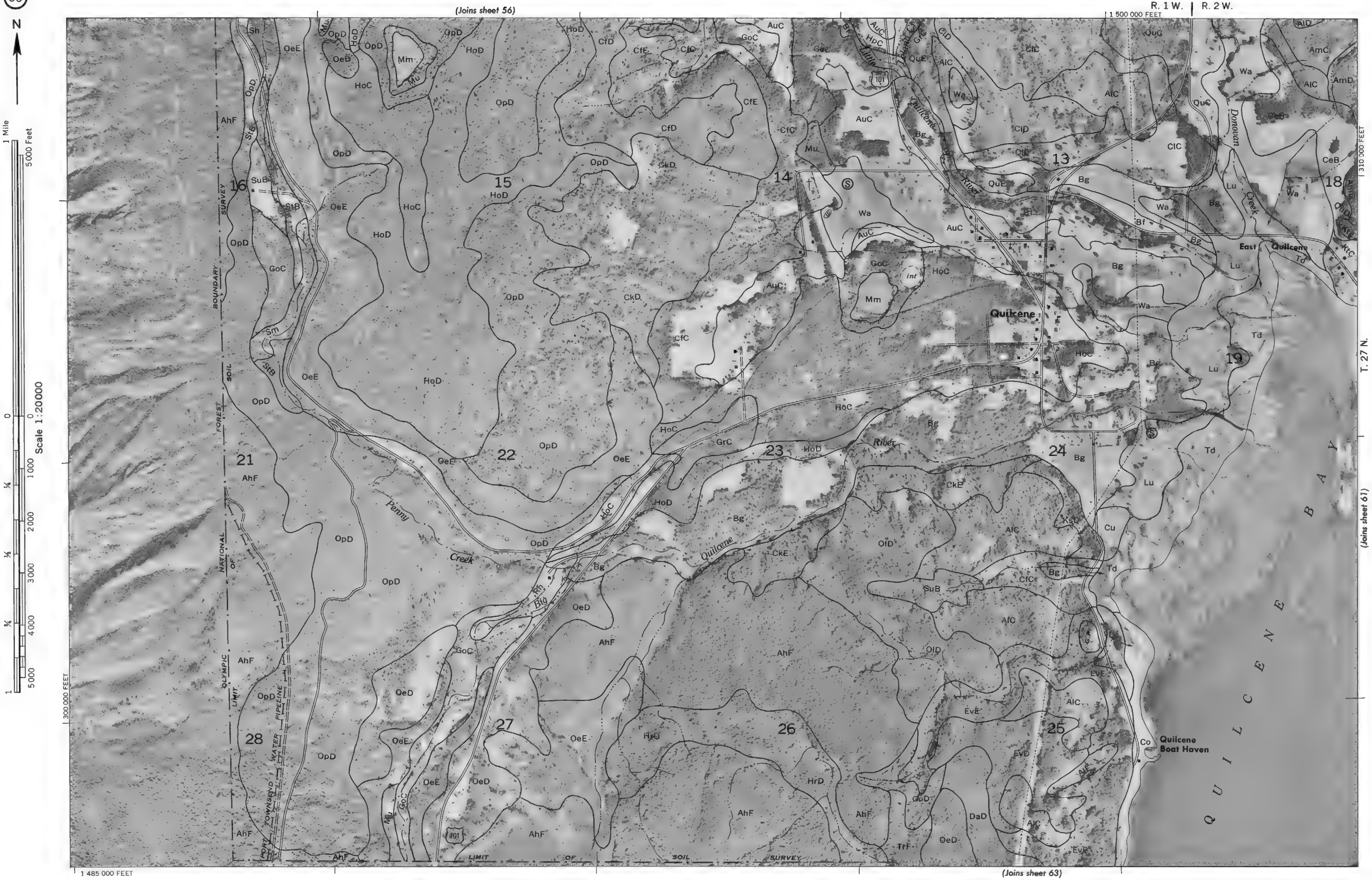
17 16 15 14 13 18

20 21 22 23 24 19

28 27 26 25 30

34 35 36 31

CGB CND SSE HLE KGF TEB KGD KAB RY CW HKD DMF


60
N
(Joins sheet 56)
(Joins sheet 61)
(Joins sheet 63)
R. 1 W.
R. 2 W.
1 500 000 FEET
310 000 FEET
300 000 FEET
1 485 000 FEET
T. 27 N.
1 Mile
5000 Feet
Scale 1:20000
Quilcene
East Quilcene
Quilcene Boat Haven
QUILCENE BAY
LIMIT OF SOIL SURVEY
OLYMPIC NATIONAL FOREST BOUNDARY
PORT TOWNSEND WATER PIPELINE
Penny Creek
Big Quilcene River
Little Quilcene River
Donovan Creek
101
13
14
15
16
18
19
21
22
23
24
25
26
27
28
OpD
OeE
OeD
HoD
HoC
Mm
Mu
AhF
GoC
SuB
StB
Sm
Sh
CfE
CfD
CfC
CkD
CkE
AuC
GrC
Bg
Bf
Wa
Lu
Td
Cu
Co
AlC
AlD
AmC
AmD
ClC
ClD
QuC
QuE
CeB
HpC
EvE
EvD
DaD
GoD
HrD
TrF
Xs
int


1 505 000 FEET
R. 1 W.
(Joins sheet 57)
N
310 000 FEET
T. 27 N.
(Joins sheet 62)
(Joins sheet 60)
(Joins sheet 64)
1 525 000 FEET
300 000 FEET
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000
¼
½
¾
1
D A B O B
B A Y
Q U I L C E N E B A Y
B O L T O N
P E N I N S U L A
T O A N D O S
P E N I N S U L A
Long Spit
water
Broad Spit
Camp Discovery
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
AlD
AmC
AmD
AlC
CfE
SwC
AlE
CeB
KtD
QuD
KtE
KtG
BdD
BdE
SwC
EvE
EvD
SnD
Co
SnC
DaC
DaD
Bm
KsC
Mm
StB
HuE
CaC
CaD
ChD
IoE
Mu
CkE
BeE
BdD

N

1 Mile 5000 Feet

Scale 1:20000

(Joins sheet 58) R. 1 W. | R. 1 E.

1 550 000 FEET

310 000 FEET

T. 27 N.

T. 26 N.

295 000 FEET

300 000 FEET

285 000 FEET

1 530 000 FEET

1 531 000 FEET

(Joins sheet 61)

(Joins inset)

(Joins lower left)

(Joins sheet 64)

Thorndyke Creek

Thorndyke Lake

Thorndyke Bay

South Point

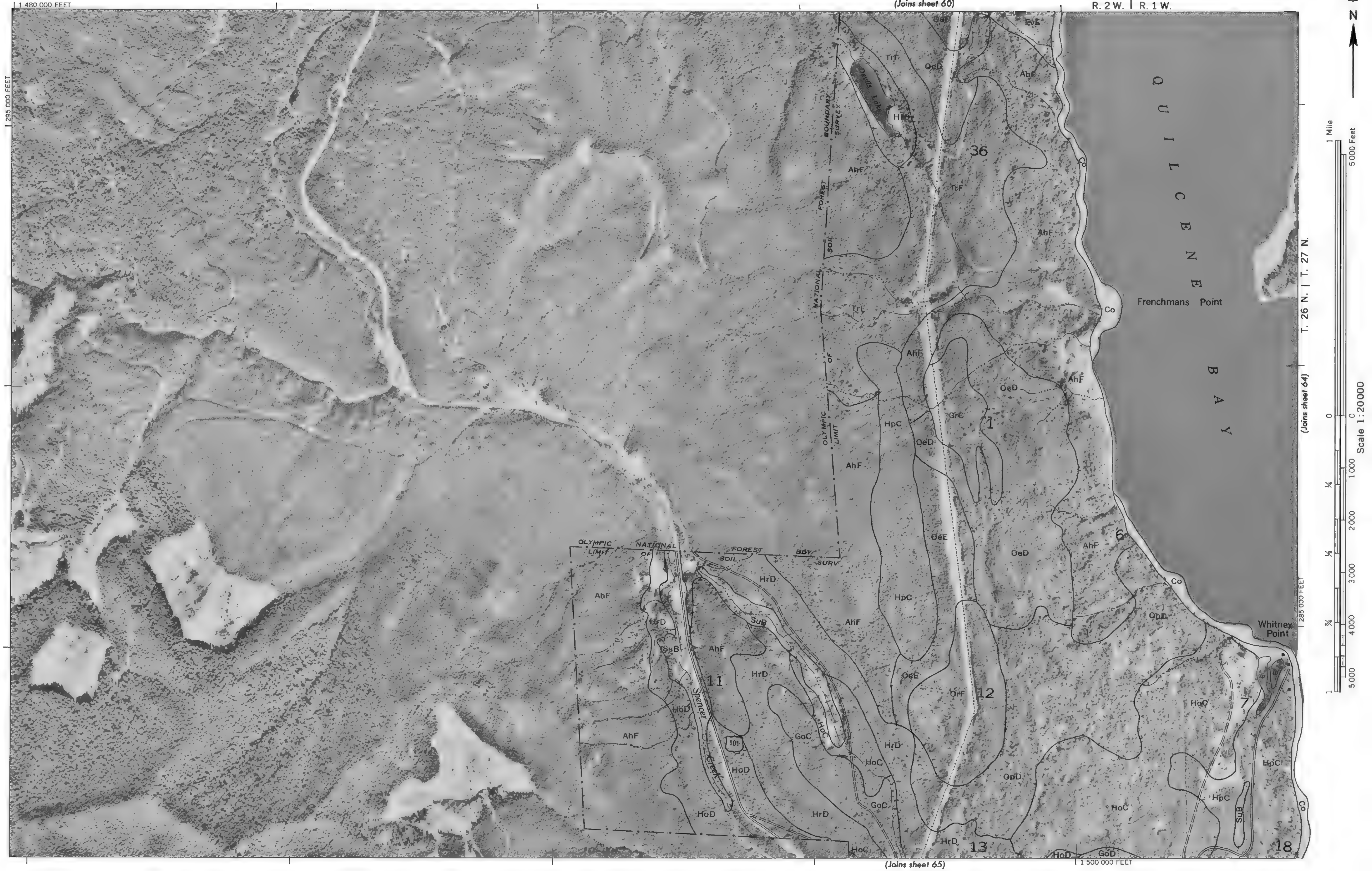
HOOD CANAL

DS NAVAL RES

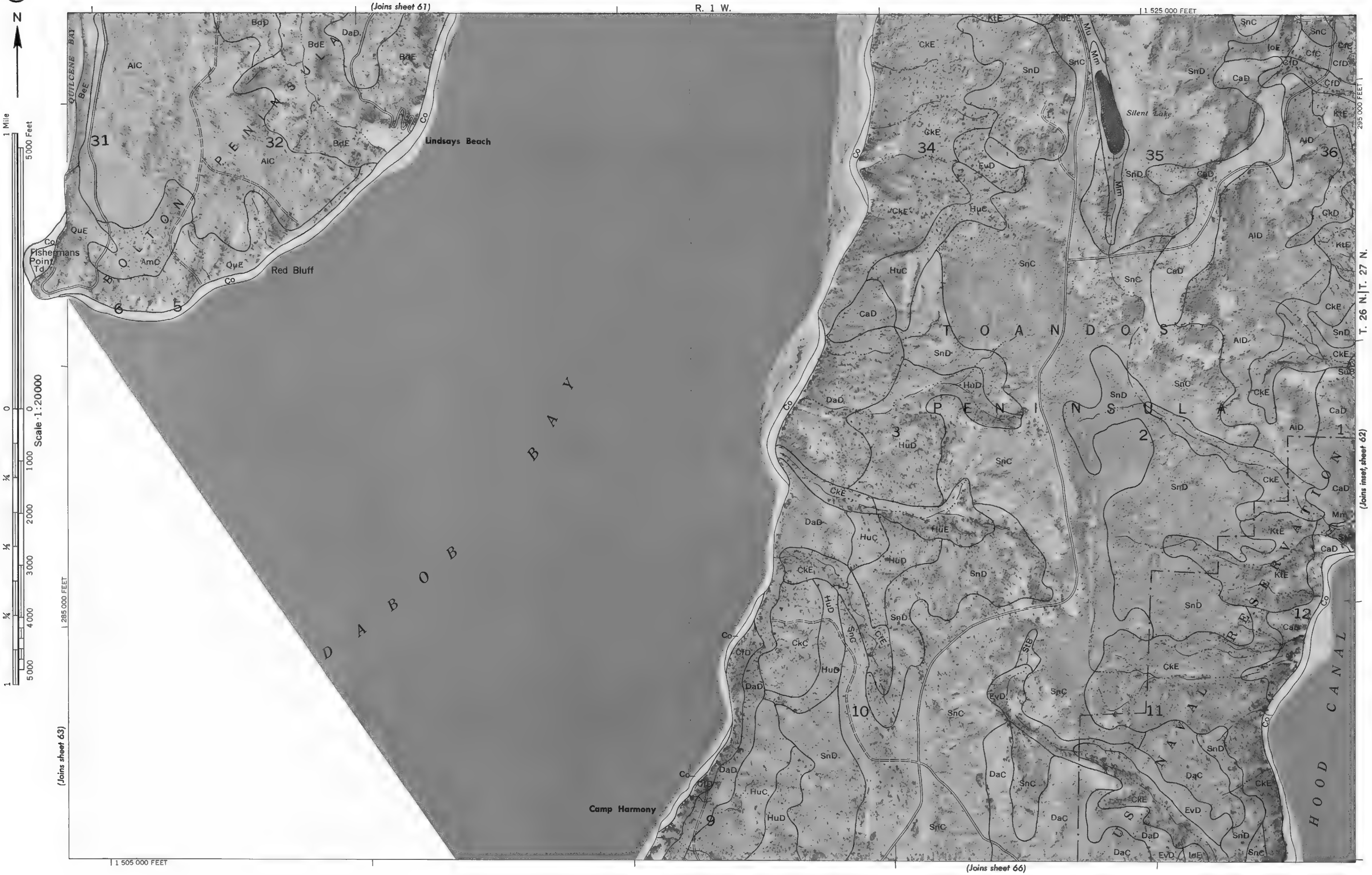
13 18 17 16 20 19 24 25 36 1

AlC AlD BaC Bg Bm CaD CfC CfD CfE CkE Co CtC DaC DaD EvC EvD HuC InC IoC KsC KtC KtD Ld Lu Mm Mu Re Sm SnC SnD StB SuB Td

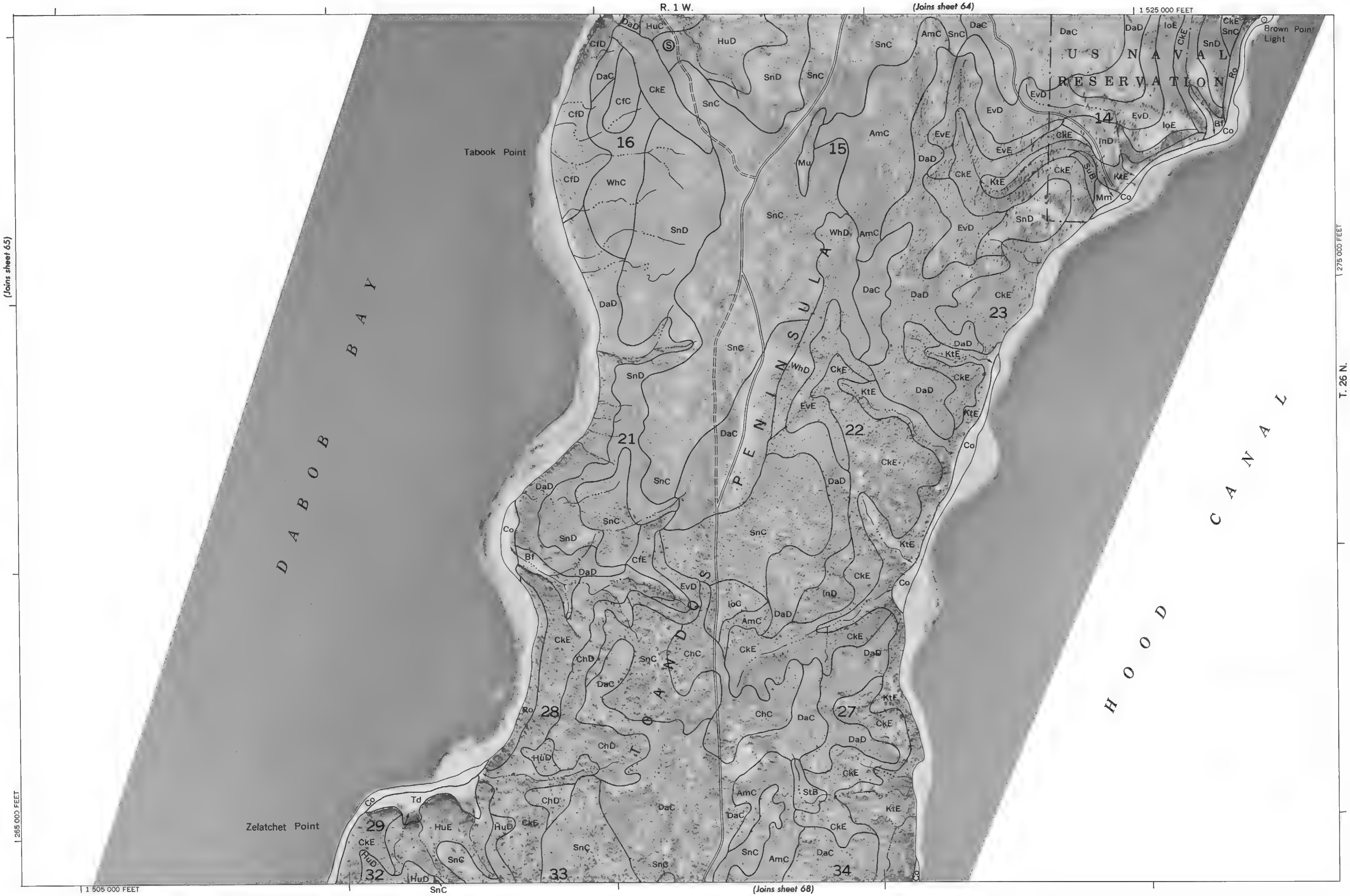
1000 AND 5000-FOOT GRID TICKS



1 480 000 FEET
(Joins sheet 60)
R. 2 W. | R. 1 W.
295 000 FEET
QUILCENE BAY
Frenchmans Point
Whitney Point
T. 26 N. | T. 27 N.
(Joins sheet 64)
285 000 FEET
(Joins sheet 65)
1 500 000 FEET
OLYMPIC NATIONAL FOREST SOIL SURVEY BOUNDARY LIMIT
Spencer Creek
101
36
1
6
7
11
12
13
18
AhF
TrF
OeD
HpC
OeE
GrC
HrD
SuB
HoD
HoC
GoC
OpD
Co
HpC
N
1 Mile
5000 Feet
Scale 1:20000


(Joins sheet 61)
R. 1 W.
1 525 000 FEET
295 000 FEET
285 000 FEET
1 505 000 FEET
(Joins sheet 63)
(Joins sheet 66)
(Joins inset, sheet 62)
T. 27 N.
T. 26 N.
N
1 Mile
5000 Feet
Scale 1:20000
QUILCENE BAY
BOLTON PENINSULA
Lindsays Beach
Red Bluff
Fishermans Point
DABOB BAY
Camp Harmony
TOANDOS PENINSULA
Silent Lake
U S NAVAL RESERVATION
HOOD CANAL
31
32
34
35
36
6
5
3
2
1
10
11
12
9


65
N
(Joins sheet 63)
R. 2 W.
R. 1 W.
1 480 000 FEET
280 000 FEET
1 473 000 FEET
270 000 FEET
NATIONAL FOREST BOUNDARY
OF SOIL SURVEY
OLYMPIC LIMIT
DOSEWALLIPS
RIVER
(Joins lower left)
T. 26 N.
265 000 FEET
OLYMPIC NATIONAL FOREST BDY
(Joins inset, sheet 69)
1 478 000 FEET
R. 2 W.
30
29
32
AkF
HrD
GoC
KsD
Bf
Bg
Rh
TrD
OrF
Spencer Creek
Marple Creek
Jackson Cove
Wawa Point
Pulali Point
DABOB BAY
13
18
19
24
HoC
HpC
GoD
OpD
GrC
GoE
AhF
Co
HpC
AuC
101
(Joins sheet 66)
Scale 1:20000
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
¼
½
¾
1
T. 26 N.
(Joins inset)
OrF
AkF
TrF
Rocky
Brook
HoG
28
33
34
35
OLYMPIC NATIONAL FOREST BOUNDARY
LIMIT OF SOIL SURVEY
HoD
(Joins sheet 67)
1 500 000 FEET
265 000 FEET


N
R. 1 W.
(Joins sheet 64)
1 525 000 FEET
(Joins sheet 65)
(Joins sheet 68)
1 505 000 FEET
265 000 FEET
275 000 FEET
T. 26 N.
Scale 1:20000
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
DABOB BAY
HOOD CANAL
TOANDOS PENINSULA
U S NAVAL RESERVATION
Tabook Point
Zelatchet Point
Brown Point Light
16
15
14
21
22
23
28
27
29
32
33
34
DaD HuC HuD SnD SnC AmC DaC CfD CkE CfC WhC Mu EvD IoE EvE InD KtE StB Mm Co Bf Ro WhD ChD ChC HuE Td IoC CfE

1 480 000 FEET

(Joins sheet 65)

R. 2 W.

N

T. 25 N. | T. 26 N.

260 000 FEET

(Joins inset, sheet 69)

DOSEWALLIPS RIVER

DOSEWALLIPS STATE PARK

Brinnon Flats

Brinnon

Sylopash Point

Walker Creek

Pleasant Harbor

D A B O B B A Y

H O O D C A N A L

SR 101

(Joins sheet 70)

250 000 FEET

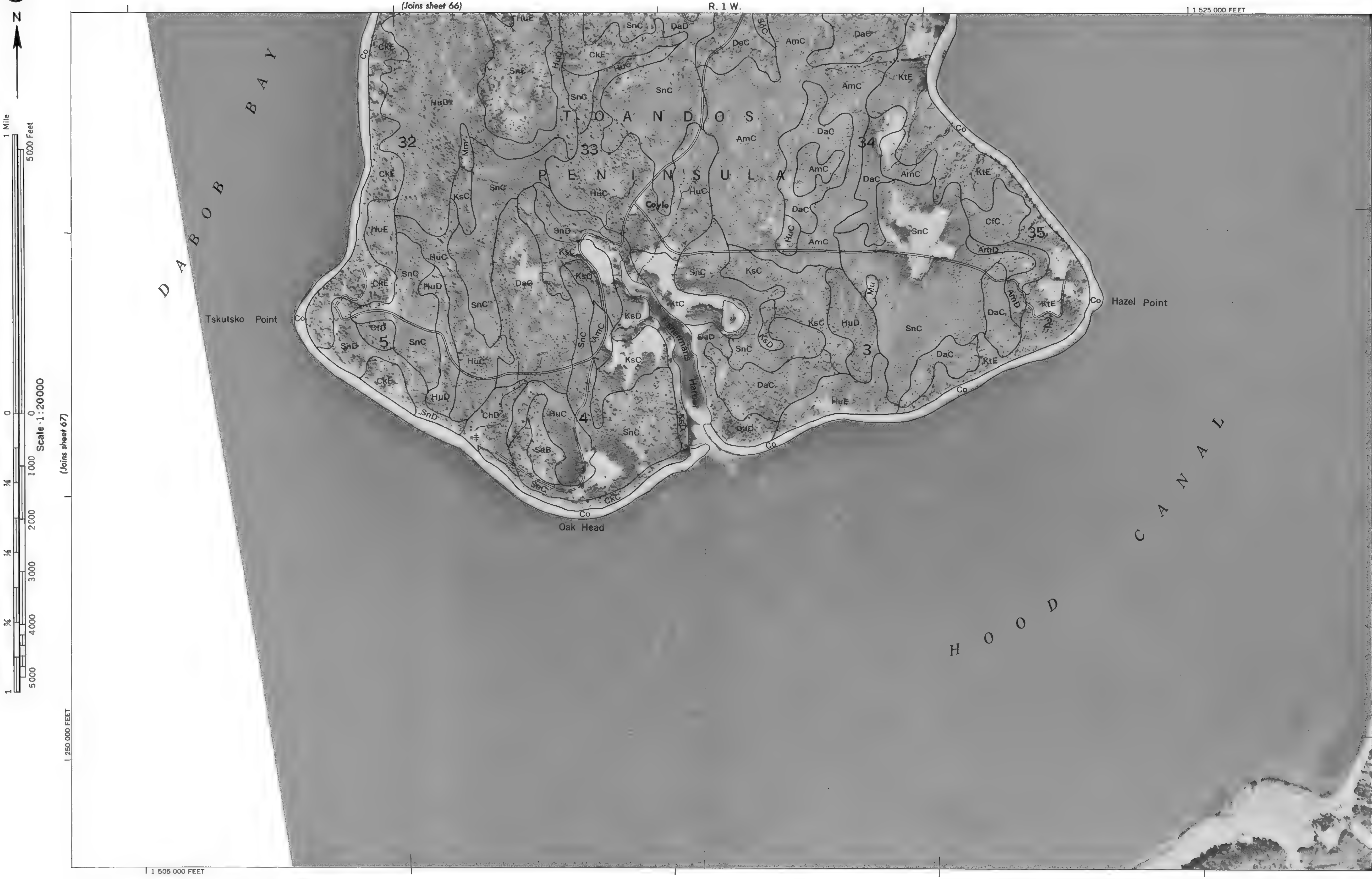
1 500 000 FEET

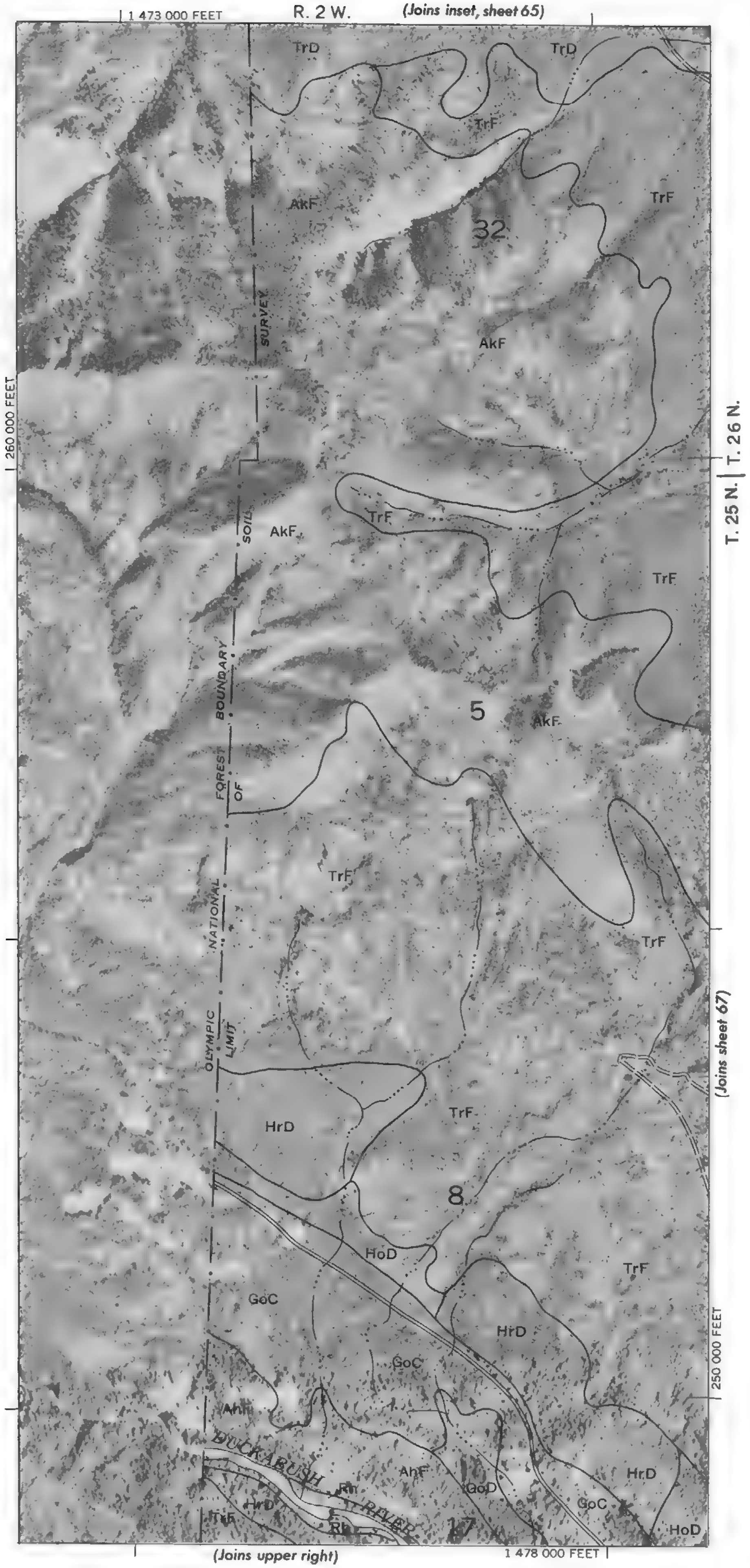
(Joins sheet 68)

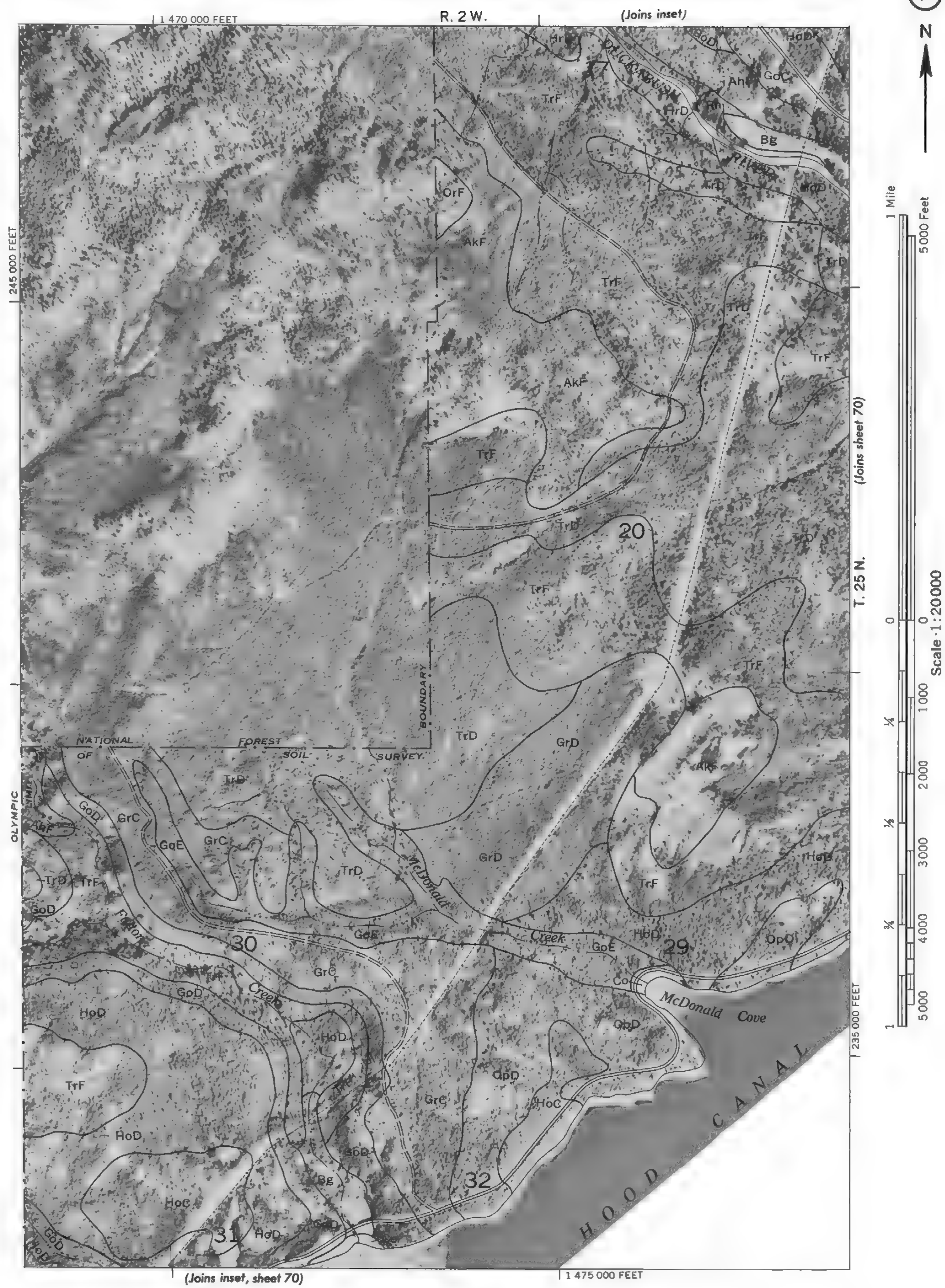
1 Mile

5000 Feet

Scale · 1:20000


N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 66)
(Joins sheet 67)
R. 1 W.
1 525 000 FEET
260 000 FEET
250 000 FEET
1 505 000 FEET
T. 25 N. | T. 26 N.
DABOB BAY
TOANDOS PENINSULA
HOOD CANAL
Tskutsko Point
Hazel Point
Oak Head
Coyle
Fishermans Harbor
32
33
34
35
2
3
4
5


1 473 000 FEET
R. 2 W.
(Joins inset, sheet 65)
260 000 FEET
T. 26 N.
T. 25 N.
(Joins sheet 67)
250 000 FEET
(Joins upper right)
1 478 000 FEET
OLYMPIC NATIONAL FOREST BOUNDARY
LIMIT OF SOIL SURVEY
32
5
8
17
TrD
TrF
AkF
HrD
HoD
GoC
AhF
GoD
Rh
DUCKABUSH RIVER


1 470 000 FEET
R. 2 W.
(Joins inset)
245 000 FEET
(Joins sheet 70)
T. 25 N.
235 000 FEET
(Joins inset, sheet 70)
1 475 000 FEET
NATIONAL FOREST BOUNDARY
OLYMPIC
LIMIT OF SOIL SURVEY
20
29
30
31
32
McDonald Creek
Fulton Creek
McDonald Cove
HOOD CANAL
DUCKABUSH RIVER
AkF
OrF
TrF
TrD
GrD
GrC
GoD
GoE
GoC
HoD
HoC
HrD
OpD
Bg
Co
N
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000
¼
½
¾
1

N

Scale 1:20000

1 Mile 5000 Feet

0 0

¼ 1000

½ 2000

¾ 3000

1 4000

5000

(Joins sheet 5)

(Joins sheet 3)

R. 13 W.

1 140 000 FEET

325 000 FEET

T. 27 N.

(Joins sheet 7)

315 000 FEET

1 120 000 FEET

(Joins sheet 12)

18 17 16 15 14

19 20 21 22 23

30 29 28 27 26

31 32 33 34 35

Goodman Creek

Mosquito Creek

Minter Creek

SVE KGF TEB CGB HLE SSE HKC HKD SPD CND DMF CVB HMC KND

70

N

1 Mile 5 000 Feet

Scale · 1 : 20000

(Joins sheet 67)

R. 2 W.

1 500 000 FEET

(Joins sheet 69)

235 000 FEET

1 480 000 FEET

Duckabush

DUCKABUSH RIVER

Black Point

Quatsap Point

HOOD CANAL

(Joins sheet 69)

R. 2 W.

1 475 000 FEET

OLYMPIC NATL. FOR. BOUNDARY

229 000 FEET LIMIT OF SURVEY

232 000 FEET

T. 25 N.

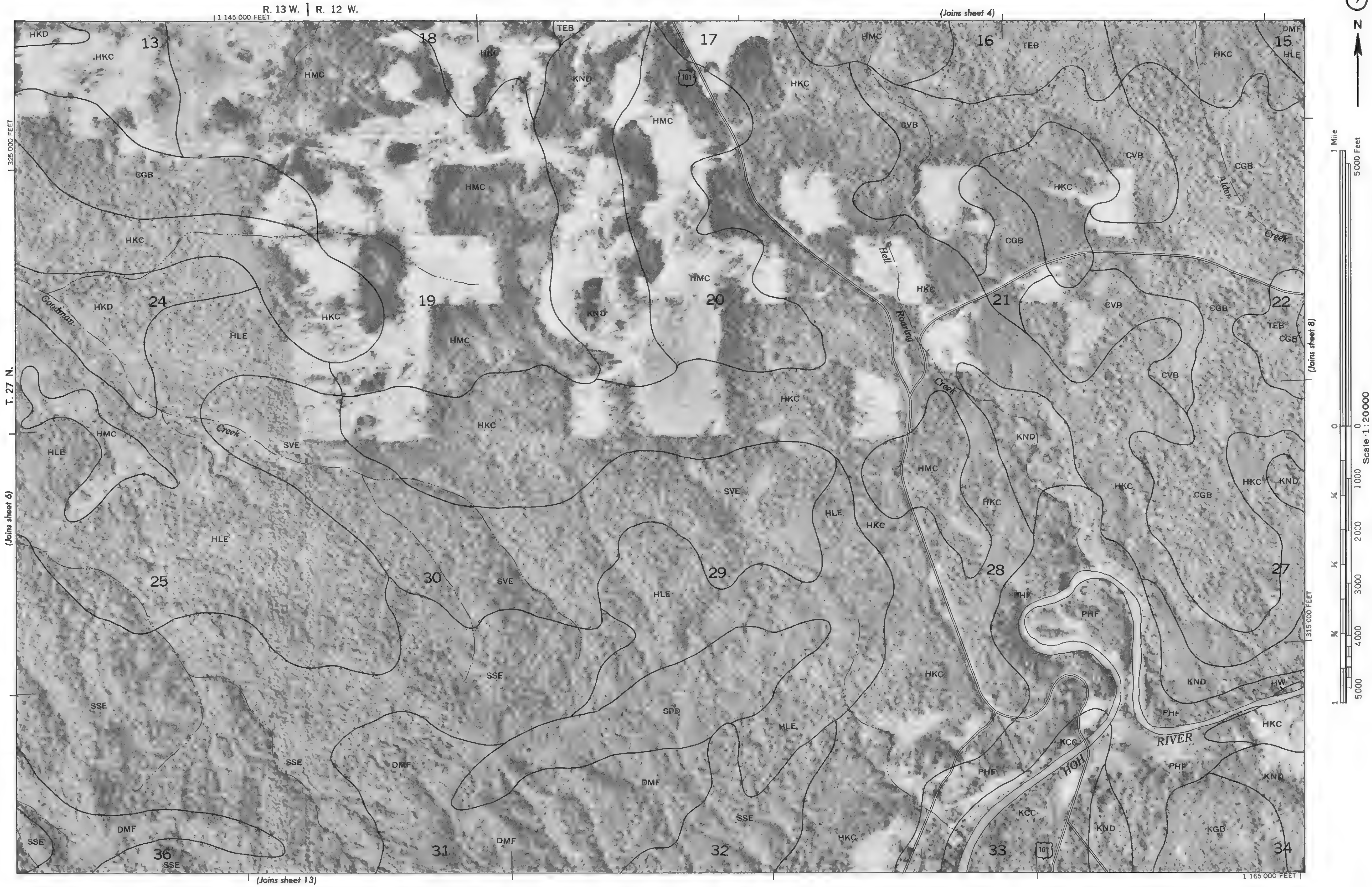
245 000 FEET

Triton Cove

MASON COUNTY

1 470 000 FEET

3000 AND 5000-FOOT GRID TICKS


7
N
R. 13 W. | R. 12 W.
1 145 000 FEET
(Joins sheet 4)
325 000 FEET
T. 27 N.
(Joins sheet 6)
(Joins sheet 8)
315 000 FEET
(Joins sheet 13)
1 165 000 FEET
1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000
Goodman Creek
Hell Roaring Creek
Alder Creek
HOH RIVER
101
13
14
15
16
17
18
19
20
21
22
24
25
27
28
29
30
31
32
33
34
36
HKD
HKC
HMC
TEB
KND
DMF
HLE
CVB
CGB
SVE
SSE
SPD
PHF
KCC
KGD
HW

JEFFERSON COUNTY AREA, WASHINGTON — SHEET NUMBER 8


1 195 000 FEET
325 000 FEET
OLYMPIC NATIONAL PARK BOUNDARY
LIMIT OF SOIL SURVEY
T. 27 N.
(Joins sheet 8)
(Joins sheet 10)
(Joins sheet 15)
R. 11 W. | R. 10 W.
1 210 000 FEET
310 000 FEET
Lindner Creek
Tower Creek
Pole Creek
Dismal Creek
Spruce Creek
Canyon Creek
Cedar Creek
HOH RIVER
15
14
21
22
23
24
19
28
27
26
25
30
33
34
35
36
31
DMF
SSE
KND
HKC
PHF
SPD
KAB
RW
HW
HH
HF
CGB
KGD
ITD
HND
N
1 Mile
5000 Feet
Scale 1:20000
0
¼
½
¾
1
1000
2000
3000
4000
5000

GUIDE TO MAPPING UNITS

For complete information about a mapping unit, read both the description of the mapping unit and that of the soil series to which it belongs. A technical description of a profile that is representative of the soil series is part of the description of the first mapping unit of each series. In referring to a capability unit or a woodland group, read the introduction to the section it is in for general information about its management. The capability classification system is explained in the section "Use and Management of the Soils." General management of the soils is discussed by capability units, beginning on page 48. Dashes in a column mean that the mapping unit was not placed in a woodland group. Other information is given in tables as follows:

Acreage and extent, table 1, page 6.
Estimated yields, table 2, page 52.

Woodland, tables 3, 4, 5, 6, and 7, pages 53 through 59.
Engineering uses of the soils, tables 8 and 9, pages 64 through 91.

Map symbol	Mapping unit	Page	Capability unit		Woodland group
			Symbol	Page	Number
AgB	Agnew silt loam, 0 to 8 percent slopes	7	IIIw-1	50	3d2
AgE	Agnew silt loam, 30 to 50 percent slopes	8	VIe-1	51	3d2
AhF	Ahl very gravelly loam, 50 to 70 percent slopes	8	VIIe-1	51	3d2
AkF	Ahl-Rock outcrop complex, 50 to 90 percent slopes	8	VIIs-1	51	4x2
AlC	Alderwood gravelly sandy loam, 0 to 15 percent slopes	8	IVe-1	50	3d2
AlD	Alderwood gravelly sandy loam, 15 to 30 percent slopes	9	VIe-1	51	3d2
AlE	Alderwood gravelly sandy loam, 30 to 50 percent slopes	9	VIe-1	51	3d2
AmC	Alderwood gravelly loam, 0 to 15 percent slopes	9	IVe-1	50	3d2
AmD	Alderwood gravelly loam, 15 to 30 percent slopes	9	VIe-1	51	3d2
AuC	Alderwood-Quilcene complex, 0 to 15 percent slopes	9	IVe-1	50	3d2
BaD	Beausite gravelly sandy loam, 15 to 30 percent slopes	10	VIe-1	51	3d2
BaE	Beausite gravelly sandy loam, 30 to 50 percent slopes	10	VIe-1	51	3d2
BdD	Beausite-Alderwood complex, 0 to 30 percent slopes	10	VIe-1	51	3d2
BdE	Beausite-Alderwood complex, 30 to 50 percent slopes	10	VIe-1	51	3d2
BeE	Beausite-Rock outcrop complex, 0 to 50 percent slopes	10	VIs-1	51	3d2
Bf	Belfast fine sandy loam	11	IIw-3	49	4w2
Bg	Belfast silt loam	10	IIw-3	49	3o2
Bh	Belfast silt loam, heavy variant	11	IIw-1	49	3o2
Bk	Belfast silt loam, wet variant	11	IIw-1	49	4w2
Bm	Belfast silty clay loam, wet variant	11	IIIw-1	50	4w2
CGB	Calawah silt loam, 0 to 8 percent slopes	11	VIe-1	51	3o1
CND	Calawah-Snahopish association, moderately steep	12	VIe-1	51	3o1
CVB	Calawah-Tealwhit association, gently rolling	12	VIe-1	51	4w1
CaC	Carlsborg gravelly loamy sand, 0 to 15 percent slopes	12	VIs-1	51	3f2
CaD	Carlsborg gravelly loamy sand, 15 to 30 percent slopes	13	VIs-1	51	3f2
CdB	Casey fine sandy loam, 0 to 8 percent slopes	13	IIIw-1	50	4w2
CeB	Casey silt loam, 0 to 8 percent slopes	13	IIIw-1	50	4w2
CfC	Cassolary sandy loam, 0 to 15 percent slopes	14	IIIe-1	49	3d2
CfD	Cassolary sandy loam, 15 to 30 percent slopes	14	IVe-3	50	3d2
CfE	Cassolary sandy loam, 30 to 50 percent slopes	14	VIe-1	51	3d2
ChC	Cassolary-Everett complex, 0 to 15 percent slopes	14	IVe-1	50	3f2
ChD	Cassolary-Everett complex, 15 to 30 percent slopes	14	VIe-1	51	3f2
CkC	Cassolary-Kitsap complex, 0 to 15 percent slopes	14	IIIe-1	49	3d2
CkD	Cassolary-Kitsap complex, 15 to 30 percent slopes	15	IVe-3	50	3d2
CkE	Cassolary-Kitsap complex, 30 to 50 percent slopes	15	VIe-1	51	3d2
ClC	Cathcart gravelly silt loam, 0 to 15 percent slopes	15	IIIe-1	49	4d2
ClD	Cathcart gravelly silt loam, 15 to 30 percent slopes	15	IVe-3	50	4d2
ClE	Cathcart gravelly silt loam, 30 to 50 percent slopes	16	VIe-1	51	4d2
CmC	Clallam gravelly sandy loam, 0 to 15 percent slopes	16	IVe-1	50	4d2
CmD	Clallam gravelly sandy loam, 15 to 30 percent slopes	16	VIe-1	51	4d2
Co&CW	Coastal beaches	16	VIIIw-1	51	---
Cu	Cut and fill land	16	VIIIw-1	51	---
DaC	Dabob very gravelly sandy loam, 0 to 15 percent slopes	17	VIe-1	51	5f2
DaD	Dabob very gravelly sandy loam, 15 to 30 percent slopes	17	VIe-1	51	5f2
DcC	Dick loamy sand, 0 to 15 percent slopes	17	VIs-1	51	4s2
DMF	Dimal very flaggy silty clay loam, 50 to 90 percent slopes	18	VIIs-1	51	4d1
EvC	Everett gravelly sandy loam, 0 to 15 percent slopes	18	VIe-1	51	3f2
EvD	Everett gravelly sandy loam, 15 to 30 percent slopes	20	VIe-1	51	3f2
EvE	Everett gravelly sandy loam, 30 to 50 percent slopes	20	VIe-1	51	3f2
GoC	Grove very gravelly loamy sand, 0 to 15 percent slopes	20	VIs-1	51	4f2
GoD	Grove very gravelly loamy sand, 15 to 30 percent slopes	21	VIs-1	51	4f2
GoE	Grove very gravelly loamy sand, 30 to 50 percent slopes	21	VIs-1	51	4f2
GrC	Grove very gravelly sandy loam, 0 to 15 percent slopes	21	VIe-1	51	3d2
GrD	Grove very gravelly sandy loam, 15 to 30 percent slopes	21	VIe-1	51	3d2
HF	Hoh fine sandy loam	23	IVw-2	51	3o1
HH	Hoh silt loam	21	IVw-2	51	2o1
HKC	Hoko gravelly silt loam, 0 to 15 percent slopes	23	VIe-1	51	3d1
HKD	Hoko gravelly silt loam, 15 to 30 percent slopes	24	VIe-1	51	3d1
HKE	Hoko gravelly silt loam, 30 to 50 percent slopes	24	VIe-1	51	3d1
HLE	Hoko-Snahopish association, hilly	24	VIe-1	51	3d1
HMC	Hoko-Tealwhit association, gently rolling	24	VIe-1	51	3d1
HNB	Hoko gravelly silt loam, wet variant, 0 to 8 percent slopes	24	VIw-1	51	3w1
HoC	Hoodsport very gravelly sandy loam, 0 to 15 percent slopes	25	VIe-1	51	3d2
HoD	Hoodsport very gravelly sandy loam, 15 to 30 percent slopes	25	VIe-1	51	3d2
HpC	Hoodsport gravelly loam, 0 to 15 percent slopes	25	IVe-1	51	3d2
HrD	Hoodsport-Grove very gravelly sandy loams, 0 to 30 percent slopes	25	VIe-1	51	3d2
HuC	Hoypus gravelly loamy sand, 0 to 15 percent slopes	25	VIs-1	51	4f2
HuD	Hoypus gravelly loamy sand, 15 to 30 percent slopes	26	VIs-1	51	4f2

Map symbol	Mapping unit	Page	Capability unit		Woodland group
			Symbol	Page	Number
HuE	Hoypus gravelly loamy sand, 30 to 50 percent slopes	26	VIs-1	51	4f2
HvC	Hoypus gravelly sandy loam, 0 to 15 percent slopes	26	VIe-1	51	4f2
HW	Huel loamy fine sand	26	VIw-1	51	3f1
InC	Indianola loamy sand, 0 to 15 percent slopes	27	VIs-1	51	4s2
InD	Indianola loamy sand, 15 to 30 percent slopes	27	VIs-1	51	4s2
IoC	Indianola sandy loam, 0 to 15 percent slopes	28	IVe-2	50	3o2
IoE	Indianola sandy loam, 15 to 50 percent slopes	28	VIe-1	51	3o2
ITD	Itswoot very cobbly silt loam, 0 to 30 percent slopes	28	VIs-1	51	3f1
ITF	Itswoot very cobbly silt loam, 30 to 60 percent slopes	28	VIs-1	51	3f1
KAB	Kalaloch loam, 0 to 8 percent slopes	29	VIe-1	51	2o1
KCC	Kalaloch gravelly loam, 0 to 15 percent slopes	29	VIe-1	51	3o1
KsC	Kitsap gravelly loam, 0 to 15 percent slopes	30	IVe-1	50	3d2
KsD	Kitsap gravelly loam, 15 to 30 percent slopes	30	VIe-1	51	3d2
KtC	Kitsap silt loam, 0 to 15 percent slopes	29	IIIe-1	49	2d2
KtD	Kitsap silt loam, 15 to 30 percent slopes	30	IVe-3	50	2d2
KtE	Kitsap silt loam, 30 to 50 percent slopes	30	VIe-1	51	2d2
KGD	Klone gravelly silt loam, 0 to 30 percent slopes	30	VIe-1	51	2f1
KGF	Klone gravelly silt loam, 30 to 60 percent slopes	31	VIe-1	51	2f1
KLD	Klone cobbly loam, 0 to 30 percent slopes	31	VIe-1	51	3f1
KLF	Klone cobbly loam, 30 to 60 percent slopes	31	VIe-1	51	3f1
KND	Klone-Hoko association, moderately steep	31	VIe-1	51	3f1
KOC	Klone-Tealwhit association, sloping	31	VIe-1	51	3f1
Lu	Lummi silt loam	31	IIIw-1	50	4w2
LyC	Lystair fine sandy loam, 0 to 15 percent slopes	32	IVe-2	50	4s2
Mm	McMurray and Mukilteo peats	33	IIw-2	49	---
Mu	Mukilteo peat, moderately shallow variant	33	IIw-2	49	---
OeD	Olete very gravelly silt loam, 0 to 30 percent slopes	34	VIe-1	51	3d2
OeE	Olete very gravelly silt loam, 30 to 50 percent slopes	34	VIe-1	51	3d2
OlD	Olete-Alderwood complex, 0 to 30 percent slopes	34	VIe-1	51	3d2
OmD	Olete-Clallam complex, 0 to 30 percent slopes	34	VIe-1	51	3d2
OpD	Olete-Hoodsport complex, 0 to 30 percent slopes	34	VIe-1	51	3d2
OrF	Olete-Rock outcrop complex, 50 to 90 percent slopes	34	VIIs-1	51	3d2
PHF	Phelan gravelly silt loam, 30 to 80 percent slopes	35	VIIe-1	51	4d1
QT	Queets silt loam	35	IVw-2	51	3o1
QuC	Quilcene silt loam, 0 to 15 percent slopes	36	IIIe-1	49	3d2
QuD	Quilcene silt loam, 15 to 30 percent slopes	37	IVe-3	50	3d2
QuE	Quilcene silt loam, 30 to 50 percent slopes	37	VIe-1	51	3d2
Rh & RW	Riverwash	37	VIIIw-1	51	---
Rk	Rock land	37	VIIs-1	51	4x2
Ro & RY	Rough broken land	37	VIIIe-1	51	---
SaB	San Juan gravelly sandy loam, 0 to 8 percent slopes	37	VIs-1	51	5f2
SC	Sekiu clay	38	VIw-1	51	---
Se	Semiahmoo muck	38	IIw-2	49	---
Sh	Semiahmoo muck, moderately shallow variant	39	IIw-2	49	---
Sm	Semiahmoo muck, shallow variant	39	IIw-2	49	---
SnC	Sinclair gravelly sandy loam, 0 to 15 percent slopes	39	IVe-1	50	4d2
SnD	Sinclair gravelly sandy loam, 15 to 30 percent slopes	40	VIe-1	51	4d2
SPD	Snahopish silty clay loam, 0 to 30 percent slopes	40	VIe-1	51	3o1
So	Snohomish silty clay loam	40	IIw-2	49	---
SSE	Solleks channery silty clay loam, 30 to 50 percent slopes	42	VIe-1	51	2f1
SVE	Solleks-Hoko association, steep	42	VIe-1	51	3d1
StB	Swantown gravelly sandy loam, 0 to 8 percent slopes	42	IVw-1	50	4w2
SuB	Swantown gravelly loam, 0 to 8 percent slopes	43	IVw-1	50	4w2
SwC	Swantown-Alderwood complex, 0 to 15 percent slopes	43	IVw-1	50	4w2
TEB	Tealwhit silty clay loam, 0 to 8 percent slopes	43	VIw-1	51	4w1
Td	Tidal marsh	44	VIIIw-1	51	---
Th	Tisch silt loam	44	IIIw-1	50	---
TlC	Townsend fine sandy loam, 0 to 15 percent slopes	45	IVe-1	50	5f2
TnC	Townsend gravelly loam, 0 to 15 percent slopes	44	IVe-1	50	5f2
TrD	Triton very gravelly loam, 0 to 30 percent slopes	45	VIe-1	51	4d2
TrF	Triton very gravelly loam, 50 to 70 percent slopes	45	VIIe-1	51	4d2
TuC	Tukey gravelly loam, 0 to 15 percent slopes	46	IVe-1	50	4d2
TuD	Tukey gravelly loam, 15 to 30 percent slopes	46	VIe-1	51	4d2
Wa	Wapato silty clay loam	47	IIIw-1	50	4w2
WhC	Whidbey gravelly sandy loam, 0 to 15 percent slopes	47	IVe-1	50	4d2
WhD	Whidbey gravelly sandy loam, 15 to 30 percent slopes	48	VIe-1	51	4d2

SOIL LEGEND

The first capital letter is the initial one of the soil name. The next letter is a capital if the mapping unit is one of the low intensity survey; it is a small letter if the mapping unit is one of the medium intensity survey. The last letter, a capital B, C, D, E, or F, indicates the slope. Most symbols without a slope letter are those of nearly level soils, but some are for land types that have a considerable range of slope.

SYMBOL	NAME
	Medium Intensity
AgB	Agnew silt loam, 0 to 8 percent slopes
AgE	Agnew silt loam, 30 to 50 percent slopes
AhF	Ahl very gravelly loam, 50 to 70 percent slopes
AkF	Ahl-Rock outcrop complex, 50 to 90 percent slopes
AlC	Alderwood gravelly sandy loam, 0 to 15 percent slopes
AlD	Alderwood gravelly sandy loam, 15 to 30 percent slopes
AlE	Alderwood gravelly sandy loam, 30 to 50 percent slopes
AmC	Alderwood gravelly loam, 0 to 15 percent slopes
AmD	Alderwood gravelly loam, 15 to 30 percent slopes
AuC	Alderwood-Quilcene complex, 0 to 15 percent slopes
BaD	Beausite gravelly sandy loam, 15 to 30 percent slopes
BaE	Beausite gravelly sandy loam, 30 to 50 percent slopes
BdD	Beausite-Alderwood complex, 0 to 30 percent slopes
BdE	Beausite-Alderwood complex, 30 to 50 percent slopes
BeE	Beausite-Rock outcrop complex, 0 to 50 percent slopes
Bf	Belfast fine sandy loam
Bg	Belfast silt loam
Bh	Belfast silt loam, heavy variant
Bk	Belfast silt loam, wet variant
Bm	Belfast silty clay loam, wet variant
CaC	Carlsborg gravelly loamy sand, 0 to 15 percent slopes
CaD	Carlsborg gravelly loamy sand, 15 to 30 percent slopes
CdB	Casey fine sandy loam, 0 to 8 percent slopes
CeB	Casey silt loam, 0 to 8 percent slopes
CfC	Cassolary sandy loam, 0 to 15 percent slopes
CfD	Cassolary sandy loam, 15 to 30 percent slopes
CfE	Cassolary sandy loam, 30 to 50 percent slopes
ChC	Cassolary-Everett complex, 0 to 15 percent slopes
ChD	Cassolary-Everett complex, 15 to 30 percent slopes
CkC	Cassolary-Kitsap complex, 0 to 15 percent slopes
CkD	Cassolary-Kitsap complex, 15 to 30 percent slopes
CkE	Cassolary-Kitsap complex, 30 to 50 percent slopes
ClC	Cathcart gravelly silt loam, 0 to 15 percent slopes
ClD	Cathcart gravelly silt loam, 15 to 30 percent slopes
ClE	Cathcart gravelly silt loam, 30 to 50 percent slopes
CmC	Clallam gravelly sandy loam, 0 to 15 percent slopes
CmD	Clallam gravelly sandy loam, 15 to 30 percent slopes
Co	Coastal beaches
Cu	Cut and fill land
DaC	Dabob very gravelly sandy loam, 0 to 15 percent slopes
DaD	Dabob very gravelly sandy loam, 15 to 30 percent slopes
DcC	Dick loamy sand, 0 to 15 percent slopes
EvC	Everett gravelly sandy loam, 0 to 15 percent slopes
EvD	Everett gravelly sandy loam, 15 to 30 percent slopes
EvE	Everett gravelly sandy loam, 30 to 50 percent slopes
GoC	Grove very gravelly loamy sand, 0 to 15 percent slopes
GoD	Grove very gravelly loamy sand, 15 to 30 percent slopes
GoE	Grove very gravelly loamy sand, 30 to 50 percent slopes
GrC	Grove very gravelly sandy loam, 0 to 15 percent slopes
GrD	Grove very gravelly sandy loam, 15 to 30 percent slopes

SYMBOL	NAME
	Medium Intensity
HoC	Hoodsport very gravelly sandy loam, 0 to 15 percent slopes
HoD	Hoodsport very gravelly sandy loam, 15 to 30 percent slopes
HpC	Hoodsport gravelly loam, 0 to 15 percent slopes
HrD	Hoodsport-Grove very gravelly sandy loams, 0 to 30 percent slopes
HuC	Hoypus gravelly loamy sond, 0 to 15 percent slopes
HuD	Hoypus gravelly loamy sand, 15 to 30 percent slopes
HuE	Hoypus gravelly loamy sand, 30 to 50 percent slopes
HvC	Hoypus gravelly sandy loam, 0 to 15 percent slopes
InC	Indianola loamy sand, 0 to 15 percent slopes
InD	Indianola loamy sand, 15 to 30 percent slopes
IoC	Indianola sandy loam, 0 to 15 percent slopes
IoE	Indianola sandy loam, 15 to 50 percent slopes
KsC	Kitsap gravelly loam, 0 to 15 percent slopes
KsD	Kitsap gravelly loam, 15 to 30 percent slopes
KtC	Kitsap silt loam, 0 to 15 percent slopes
KtD	Kitsap silt loam, 15 to 30 percent slopes
KtE	Kitsap silt loam, 30 to 50 percent slopes
Lu	Lummi silt loam
LyC	Lystair fine sandy loam, 0 to 15 percent slopes
Mm	McMurray and Mukilteo peats
Mu	Mukilteo peat, moderately shallow variant
OeD	Olete very gravelly silt loam, 0 to 30 percent slopes
OeE	Olete very gravelly silt loam, 30 to 50 percent slopes
OlD	Olete-Adlerwood complex, 0 to 30 percent slopes
OmD	Olete-Clallam complex, 0 to 30 percent slopes
OpD	Olete-Hoodsport complex, 0 to 30 percent slopes
OrF	Olete-Rock outcrop complex, 50 to 90 percent slopes
QuC	Quilcene silt loam, 0 to 15 percent slopes
QuD	Quilcene silt loam, 15 to 30 percent slopes
QuE	Quilcene silt loam, 30 to 50 percent slopes
Rh	Riverwash
Rk	Rock land
Ro	Rough broken land
SaB	San Juan gravelly sandy loam, 0 to 8 percent slopes
Se	Semiahmoo muck
Sh	Semiahmoo muck, moderately shallow variant
Sm	Semiahmoo muck, shallow variant
SnC	Sinclair gravelly sandy loam, 0 to 15 percent slopes
SnD	Sinclair gravelly sandy loam, 15 to 30 percent slopes
So	Snohomish silty clay loam
StB	Swantown gravelly sandy loam, 0 to 8 percent slopes
SuB	Swantown gravelly loam, 0 to 8 percent slopes
SwC	Swantown-Alderwood complex, 0 to 15 percent slopes
Td	Tidol marsh
Th	Tisch silt loam
TlC	Townsend fine sandy loam, 0 to 15 percent slopes

SYMBOL	NAME
	Medium Intensity
TnC	Townsend gravelly loam, 0 to 15 percent slopes
TrD	Triton very gravelly loam, 0 to 30 percent slopes
TrF	Triton very gravelly loam, 50 to 70 percent slopes
TuC	Tukey grovelly loam, 0 to 15 percent slopes
TuD	Tukey gravelly loam, 15 to 30 percent slopes
Wa	Wapato silty clay loam
WhC	Whidbey gravelly sandy loam, 0 to 15 percent slopes
WhD	Whidbey gravelly sandy loam, 15 to 30 percent slopes
	Low Intensity
CGB	Calawah silt loam, 0 to 8 percent slopes
CND	Calawah-Snahopish association, moderately steep
CVB	Calawah-Tealwhit association, gently rolling
CW	Coastal beaches
DMF	Dimal very flaggy silty clay loam, 50 to 90 percent slopes
HF	Hoh fine sandy loam
HH	Hoh silt loam
HKC	Hoko gravelly silt loam, 0 to 15 percent slopes
HKD	Hoko gravelly silt loam, 15 to 30 percent slopes
HKE	Hoko gravelly silt loam, 30 to 50 percent slopes
HLE	Hoko-Snahopish association, hilly
HMC	Hoko-Tealwhit association, gently rolling
HNB	Hoko gravelly silt loam, wet variant, 0 to 8 percent slopes
HW	Huel loamy fine sand
ITD	Itswoot very cobbly silt loam, 0 to 30 percent slopes
ITF	Itswoot very cobbly silt loam, 30 to 60 percent slopes
KAB	Kalaloch loam, 0 to 8 percent slopes
KCC	Kalaloch gravelly loam, 0 to 15 percent slopes
KGD	Klone gravelly silt loam, 0 to 30 percent slopes
KGF	Klone gravelly silt loam, 30 to 60 percent slopes
KLD	Klone cobbly loam, 0 to 30 percent slopes
KLF	Klone cobbly loam, 30 to 60 percent slopes
KND	Klone-Hoko association, moderately steep
KOC	Klone-Tealwhit association, sloping
PHF	Phelan gravelly silt loam, 30 to 80 percent slopes
QT	Queets silt loam
RW	Riverwash
RY	Rough broken land
SC	Sekiu clay
SPD	Snahopish silty clay loam, 0 to 30 percent slopes
SSE	Salleks channery silty clay loam, 30 to 50 percent slopes
SVE	Salleks-Hoko association, steep
TEB	Tealwhit silty clay loam, 0 to 8 percent slopes

JEFFERSON COUNTY AREA, WASHINGTON

CONVENTIONAL SIGNS

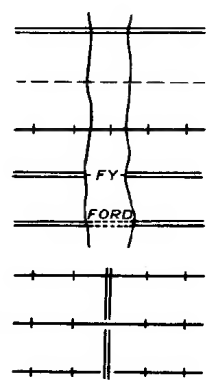
WORKS AND STRUCTURES

Highways and roads
- Divided
- Good motor
- Poor motor
- Trail

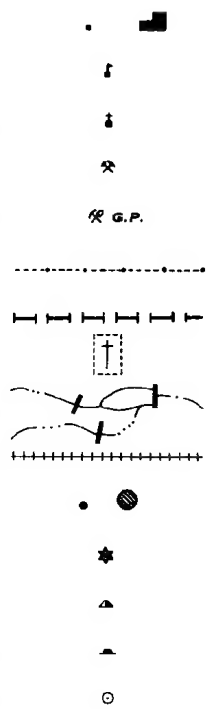
Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry
- Ford
- Grade
- R. R. over
- R. R. under



- Buildings
- School
- Church
- Mine and quarry
- Gravel pit
- Power line
- Pipeline
- Cemetery
- Dams
- Levee
- Tanks
- Lighthouse
- Forest fire or lookout station
- Sawmill
- Navigation flasher light



BOUNDARIES

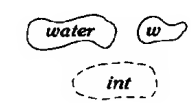
- National or state
- County
- Minor civil division
- Reservation
- Soil survey
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified
- Canals and ditches

Lakes and ponds
- Perennial
- Intermittent



- Spring
- Marsh or swamp
- Wet spot
- **Drainage end or alluvial fan**

RELIEF

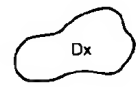
Escarpments
- Bedrock
- Other
- Short steep slope
- Prominent peak

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

- Soil boundary and symbol



- Gravel
- Stoniness
  - Stony
  - Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Orcas peat
- Sand dunes
- Coastal rocks
- Soil sample site

- Complex of very wet marine sand and organic soils with water table at or near the surface; which fluctuates with the tide.